FLIGHT, JULY 28, 1938 FIRST AERO WEEKLY IN THE WORLD REGD. AT THE G.P.O. AS A NEWSPAPER

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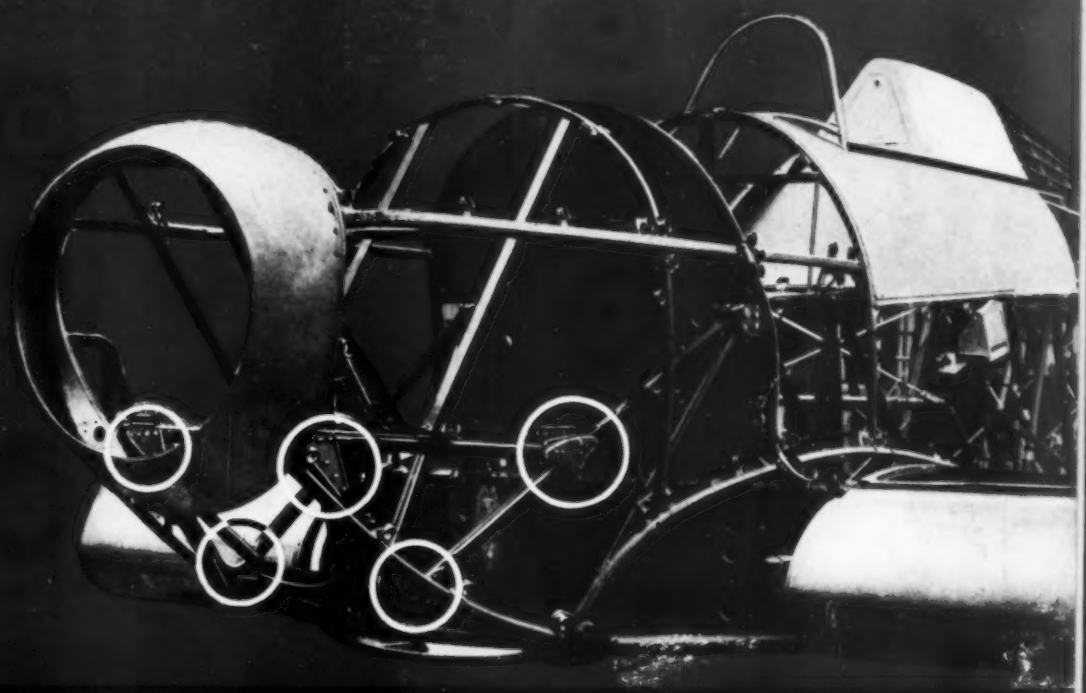

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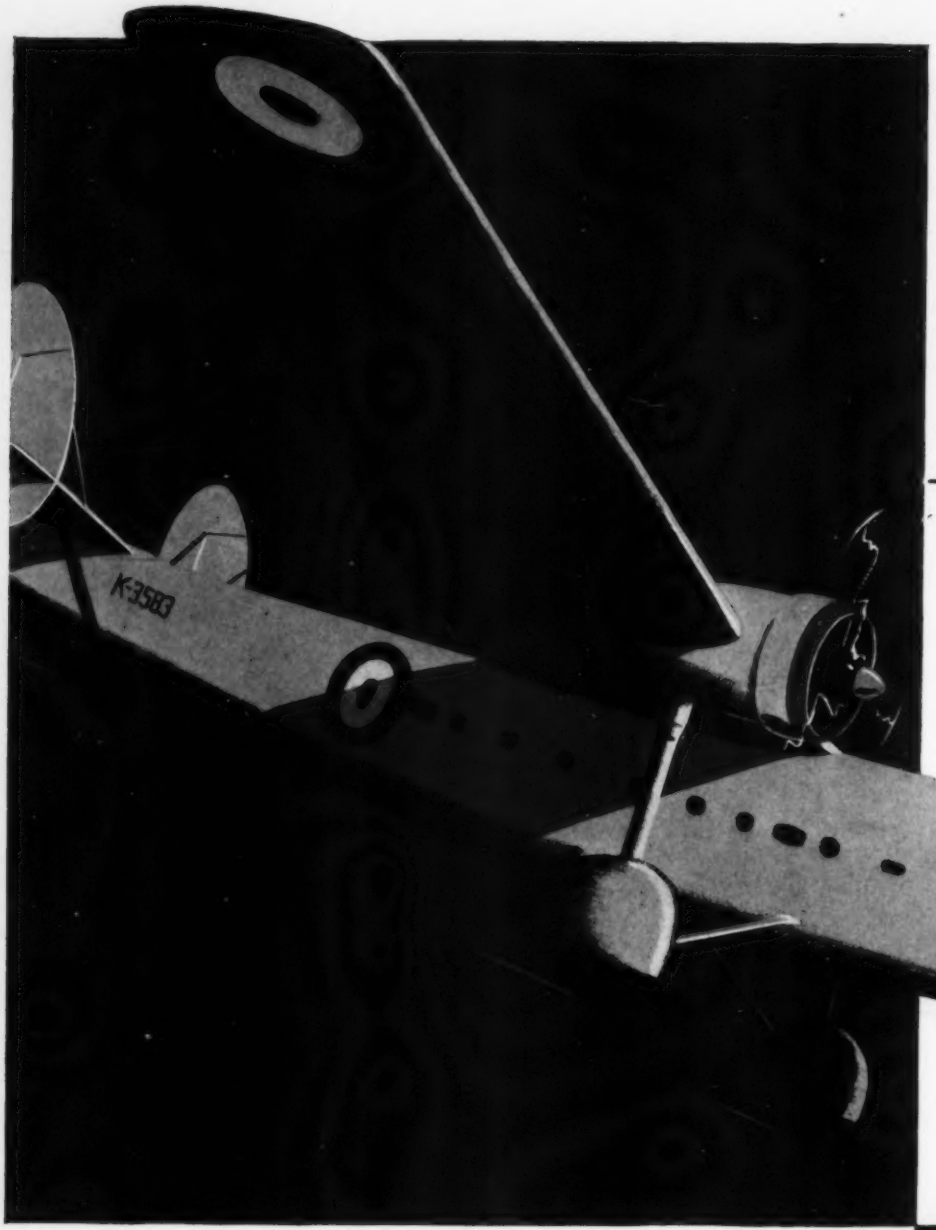

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The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (50 lines)

8-10, CORPORATION ST., COVENTRY. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.

GUILDHALL BUILDINGS, NAVIGATION ST., BIRMINGHAM, 2. Telegrams: Autopress, Birmingham. Telephone: Midland 2971.

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26B, RENFIELD ST. GLASGOW, C.2. Telegrams: Iliffe, Glasgow. Telephone: Central 4857

SUBSCRIPTION RATES: Home and Canada: Year, £1 13 0. 6 months, 16s. 6d. 3 months, 8s. 6d.
Other Countries: Year, £1 16 0. 6 months, 18s. 0d. 3 months, 9s. 0d.

No. 1544. Vol. XXXIII. JULY 28, 1938. Thursdays, Price 6d

The Outlook

The C.A.G.

THE Civil Air Guard scheme for cheaper flying instruction, announced by Sir Kingsley Wood on Saturday (and foreshadowed in *Flight* last week) is based upon an extension of the present light aeroplane club subsidy scheme. Clubs which are already subsidised will form a C.A.G. section, and those not already subsidised will be eligible provided they comply with certain requirements in the matter of aeroplanes and flying charges.

The *raison d'être* of the C.A.G. scheme is, of course, to encourage, by lowering the hourly charges, many more people to take up flying, and it is not surprising that it has already met with an enthusiastic response all over the country. Basically the idea is commendable, but unless it is made perfectly clear from the very beginning that a very large percentage of the cheaply trained (cheaply to themselves, that is) pilots would, in time of emergency, be called upon to assist " in other directions concerned with aviation for which their services might be required " and not to do flying, there is likely to be ultimate disappointment and dissatisfaction.

An " A " licence pilot who has been taught in a light plane provided with a minimum of equipment is not likely to be of much use if put on board one of the latest military aeroplanes, and will require a good deal of further training and practice, even if otherwise eligible, for ferry work or similar Service duties. The most that can be expected is that he (or she) will have become accustomed to being in the air and will have a certain amount of experience in judging height and speed during the approach to land.

Weak Points

THE idea of putting C.A.G. members into " a special brown overall with a specially designed 'Civil Air Guard' badge on the pocket " is not likely to make for harmony in those clubs at which some members are trained on the existing basis and have not undertaken to offer their services in a national emergency. None of us likes to be made conspicuous, and it would be better were this part of the scheme omitted.

From the clubs' point of view the C.A.G. plan is likely to prove a financial success, and after the lean time many of the clubs have had none will grudge them their four years of relative plenty. With a grant of £50 instead of £25 for " A " licences on standard training types, and £30 for those on light aircraft types, the new hourly rates of 10s. and 5s. at week-ends and 5s. and 2s. 6d. during the week should suffice. But the quadrupling of the flying grant for post-licence flying, attractive as it looks, is largely nullified by the limit of ten hours per annum. It is difficult to see why such an absurd limit has been fixed.

Ten hours' flying a year after obtaining the " A " licence is no use to anyone, either the pilot or the country, and fifty hours would have been more reasonable. Probably the assumption is that after a pupil has obtained his licence and has done his ten hours' flying afterwards, at the cheap rates, he will be willing to pay standard rates for the rest of his flying. That assumption seems to us a very doubtful one, and it is precisely the post-licence flying that is valuable. In fact, we would go further and say that it would have been better to have kept the pre-licence hourly rates higher and to make post-licence flying really cheap. That is where the shoe pinches, as evidenced by the large number of " A " licence pilots who have in the past given up flying after getting their " tickets."

The decision that " aircraft of foreign manufacture may be used, though their use will be reviewed after about four years " is typical of the panic measures which the Air Ministry is now adopting right and left. Why, in the name of common sense, foreign aircraft manufacturers should be allowed to benefit is difficult to understand. That we should go to America for training types on which to train pilots for the R.A.F. direct was perhaps just understandable. But to go abroad for machines on which to train " A " licence pilots, the usefulness of the majority of whom will be extremely limited, is quite absurd, and totally unjust to our own manufacturers of light aircraft, as well as being entirely unnecessary.

Canadian Co-ordination

WHATEVER may be one's views of the wisdom or necessity of buying aeroplanes in America, no one can fail to applaud the decision to place orders for military aircraft in Canada. Nobody, the British aircraft industry least of all, minds Canada doing its bit towards

the equipment of the expanded R.A.F. Moreover, the Canadian scheme is to be regarded in the light of a long-range supply, in more ways than one, capable of continuing to manufacture military aircraft for us in the unfortunate event of our being involved in a European war.

Canadian industry has recently taken the very wise step of creating a co-ordinating company, which will act as the intermediary between the Canadian manufacturing firms and the British Government. In this way not only will time be saved, but if the new body is established on the right lines (no final decision has been reached) the uniformity of Canadian-built aircraft is more likely to be assured.

The position is not without delicacy and will want careful and tactful handling, but with good will on all sides it should be possible to arrive at an arrangement satisfactory to all concerned. The mission which has gone to Canada, headed by Sir Hardman Lever, and including that most persuasive of all British ambassadors, Mr. F. Handley Page, President of the Society of British Aircraft Constructors, may be counted upon to use tact in dealing with the various problems which are bound to arise.

It is very necessary that there should be no repetition of certain incidents which have left a rather bad taste in America, and have given at least one famous American aircraft constructor a poor idea of British courtesy.

Range, Load and Speed

BY its recent flight from Foynes to Montreal, a distance of 2,860 miles, in 20 hours 20 minutes, carrying a pay load of 1,000 lb., the *Mercury*, upper component of the Short-Mayo composite aircraft, has demonstrated not only the feasibility of transporting a considerable pay load from Great Britain to the American continent against prevailing winds, but that the running cost need not be prohibitive.

It would, of course, be unfair to take the combined cost of the *Maia* and *Mercury*, and the actual running cost of the latter's flight and set them against the pay load. No one has ever suggested running a service with one composite aircraft. The scheme is only practical when the intensity of traffic is such that frequent launches can be made in both directions, and a composite aircraft service would be operated by at least one lower component at each end and a number of upper components working the shuttle service.

No cost figures could thus be worked out on a basis of this first flight, but it is of interest to note that the average fuel consumption during the flight worked out at about 54 gallons per hour for the four Napier Rapier VI engines. That is to say, the *Mercury* used something like 1,100 gallons of petrol, the cost of which would be in the neighbourhood of £80. As the pay load was 1,000 lb. the cost in petrol of carrying the pay load over a distance of 2,860 miles was about 1s. 7d. per pound. Fuel cost is not, of course, the only one, but this amazingly low figure does afford a good example of the economy which results from operating an upper component of small size and relatively low power. (The Napier Rapier VI engines are rated at 370 b.h.p. at 4,750ft.)

Incidentally, it may be pointed out that the *Maia* demonstrated another claim which has been advanced by the advocates of composite aircraft: that when not launching upper components the lower component can be used for normal commercial operation. The machine carried ten passengers from Southampton to Foynes.

In spite of headwinds which varied in strength, but probably averaged 25 m.p.h., the *Mercury's* average ground speed between Foynes and Montreal was about 141 m.p.h., and over the Atlantic section it was about 152 m.p.h., which is remarkably good for the engine power, and shows that for a seaplane *Mercury* is very efficient.

The Next Step

THE claim advanced by Major Mayo, in the early days of composite aircraft discussions, that the scheme would double the range and pay load and greatly increase the cruising speed, appears to have been fully justified. The *Mercury* was launched at a gross weight of 20,800 lb., at which the machine was fully within its C. of A. weight. For alighting, and for unassisted take-off, the C. of A. is 14,000 lb., a difference of 6,800 lb. which can be used for fuel and pay load. When the machine landed at Montreal there were about 80 gallons of fuel left, so that the range must be at least 3,000 miles against the headwinds encountered, and probably 3,500 miles in still air.

We believe that the official performance test figures are a top speed of 212 m.p.h. and a cruising speed of 182 m.p.h. For 1,480 b.h.p. that is remarkably good, and in this connection it should be pointed out that if the *Mercury* had been a landplane with retractable undercarriage the cruising speed would probably be increased by about 50 m.p.h. The lower drag could be used to obtain the higher speed, or to increase the range, or to carry a greater pay load, or a combination of the three.

The demonstration has definitely shown that the composite aircraft scheme is workable, and indicates that with the appropriate ground organisation and a proper number of upper and lower components a commercial service could be operated. For providing that proof the Short-Mayo concerns, Imperial Airways, and the Air Ministry deserve credit.

That a landplane version of the upper component will follow is not to be doubted. There might be practical difficulties in finding suitable sites for mounting it on the *Maia*, and so it is legitimate to assume that a landplane lower component will be needed. At present the Ensign class is about the only suitable type, and so we may expect to see one modified to act as lower component.

The Contents of a Haversack

WHEN in the Great War embryo officers were getting headaches over the study of the military manuals, one phrase never failed to arouse delight and hilarity. It was laid down that the soldier's haversack should contain (among other things) "the unexpended portion of the previous day's ration."

That is English as written by the officer of the regular Army, presumably a former cadet of Sandhurst or Woolwich. Its grammar is beyond reproach, and it makes its meaning clear beyond all possibility of doubt. These are merits, but none the less the phrase is dreadful.

"But surely," our readers will say, "that sort of thing might have gone down all right with the Royal Military College and the Royal Military Academy, but our own modern R.A.F. Cranwell will rise to something better than that." Well, we hope that it will, but evidently it will have its work cut out to do so, for in the March examinations for admission to the R.A.F. College nearly half the candidates failed to gain half marks in English and general knowledge. Cranwell is not to blame for that; the fault lies with the schools.

We certainly hope that the Professor of English at Cranwell will be able to do something about this knowledge of English. It is the permanent commission officers of the Air Force who come in time to rule the Air Ministry, and who have to draw up the Weekly Orders and so forth. There have been times when the wording of those orders has reduced us to tearful mirth, and we tremble for the future if the output from Cranwell should regularly have an insufficient knowledge of English.

Forthcoming Events

July 29-August 1. Courtral Rally, Belgium.
July 30. Official opening of Exeter Airport by Secretary of State for Air.
July 30. Folkestone Aero Trophy Race, Lympne.
August 20. Eastbourne Flying Club: Garden Party and Opening of New Club-house.
August 27-28. Southend Flying Club: Flying Meeting and Race.
September 3. Cinque Ports Wakefield Cup Race, Lympne.
September 10. Cardiff Aeroplane Club: London-Cardiff Race.
September 11-18. Swedish Civil Aviation Week.
September 21. Aero Golfing Society: Cellon Trophy, Richmond Golf Club.
November 18-December 4. Paris Aero Show.

THE COAST DEFENCE EXERCISES

Last Week's Instructive Operations : Some Impressions by "Flight" Representatives who Flew in the Defending Aircraft

Illustrated with "Flight" Photographs

THE GENERAL SCHEME

WAR between Blue and Red was declared at midnight on Tuesday-Wednesday, July 19-20. Blue was an enemy naval force in the North Sea, consisting of four battleships, the carrier *Courageous*, four cruisers of the 2nd Cruiser Squadron, two destroyer flotillas and one submarine flotilla, the whole under Admiral Sir Charles Forbes, C.-in-C. the Home Fleet. Two of the destroyers, *Fury* and *Foxhound*, were detailed as air safety vessels, presumably to help aircraft in distress.

The Red (defending) naval force was a skeleton of two cruisers and four destroyers, but it was held to represent a more powerful fleet than that of Blue. Territorial gunners and sappers manned the coast fortresses of the Forth, Tyne, Harwich, Thames and Medway. No anti-aircraft guns or searchlights were manned.

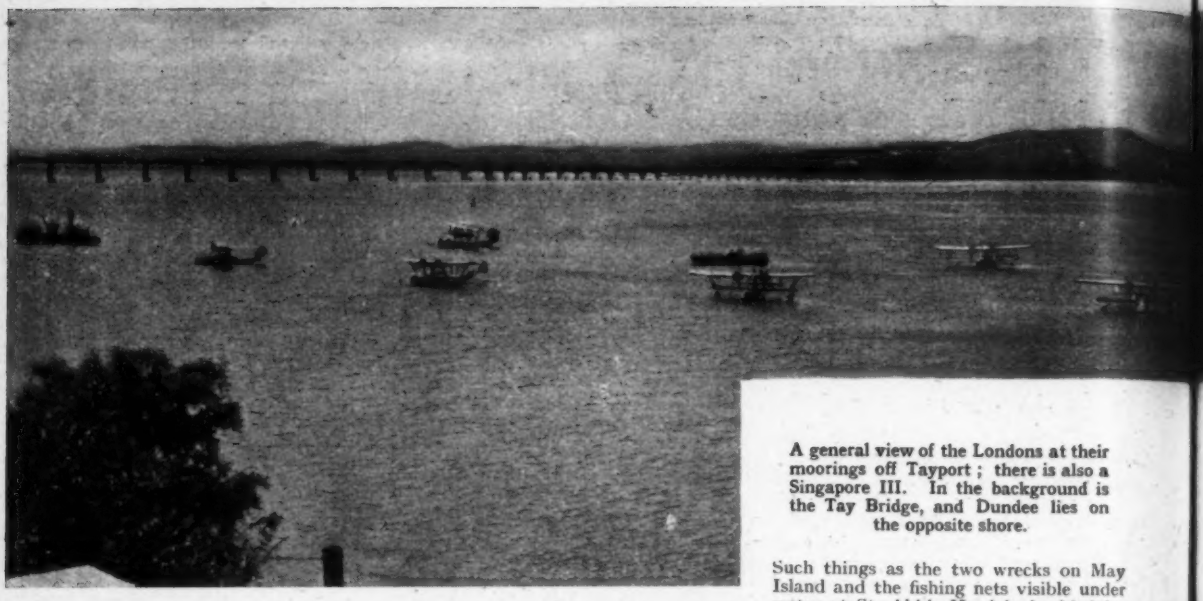
The Red Air Force consisted of the following units: No. 201 (G.R.) Squadron (Saro Londons) at Newport on the Tay, No. 204 (G.R.) Squadron (Londons) at Invergordon, No. 228 (G.R.) Squadron (Supermarine Stranraers) at Invergordon, and the following G.R. squadrons equipped with the Anson: 206 and 220 at Bircham Newton, 224 and 269 at Montrose, 233 at Thornaby; one torpedo-bomber squadron, No. 42 (Vildebeest IV) was stationed at Thornaby, while four fighter squadrons were detailed to defend the Thames, *viz.*, 54 (Gloster Gladiators) and 74 (Gloster Gauntlets) at Hornchurch and 56 (Hawker Hurricanes) and 151 (Gloster Gauntlets) at North Weald. The fighters were under Air Vice-Marshal Gossage, and the G.R. and T.B. squadrons under Air Marshal Sir Frederick Bowhill.

On Wednesday morning the visibility was poor and hampered air reconnaissance. The first warlike activities were attacks on Rosyth, Montrose, Leuchars, and Thornaby by Blue aircraft from the *Courageous*, and the Red fleet was also attacked from the air as it lay at anchor, but without suffering serious damage. The first tidings of the Blue vessels came in about 6.30 a.m. from merchant ships which had been attacked by submarines off the Yorkshire coast. Soon after 7 a.m. Red aircraft found a Blue cruiser off the Orkneys. At 2 p.m. Red aircraft found the Blue battle fleet north-east of the Dogger Bank and steering towards the coast. At 7 p.m. the Red fleet, in overwhelming strength, caught the enemy and mauled it severely. The Blue flagship, H.M.S. *Nelson*, was put out of action for six hours. The umpires then stopped the battle.

The Blue cruisers were not present at this battle, but at 8.20 p.m. two of them, with three destroyers, were found by Red aircraft 75 miles off Lowestoft. A superior Red force of cruisers and destroyers caught them and engaged them at 1 a.m. on Thursday.

Red air patrols started off again at 4 a.m. on Thursday, and it was found that the Blue fleet had separated. Two battleships, with destroyers, bombarded the mouth of the Tyne, and one battleship, with destroyers, the Firth of Forth. The Red battlefleet moved to the east of them to cut off their retreat and happened upon H.M.S. *Nelson*, which was lying in support of the attacks. It seems that she was again shot to pieces. Red

Two glimpses from the windows of a London II of No. 201 (G.R.) Squadron which intercepted the Blue battle fleet. In the lower picture the four destroyers have just broken away from the battle formation, and the London was about to determine their new bearing.



A general view of the Londons at their moorings off Tayport; there is also a Singapore III. In the background is the Tay Bridge, and Dundee lies on the opposite shore.

air striking forces attacked the Blue ships off the Tyne.

Meantime, other Blue cruisers were operating to the south, and two cruisers, with destroyers, bombarded the defences of Harwich at 4.40 a.m., but were subsequently engaged by superior Red surface and air forces.

Far to the north a Blue cruiser was located by aircraft 80 miles east of the Shetlands at 8 a.m. on Thursday, but at 1 p.m. the same day she was sunk by a Red cruiser.

About noon on Thursday the Blue ships were allowed to withdraw to establish a new position, and the Red aircraft were not allowed to search for them until 6 p.m. that evening. When they began to reconnoitre again they found several Blue ships some 150 miles away from the coast, and one aircraft attacked a Blue cruiser.

On Friday at dawn the Red aircraft were out all along the coast, and by 6 a.m. they sighted two Blue cruisers 150 miles off Peterhead. Both of these were sunk by Red cruisers during the day. About 9.30 a.m. the aircraft found two further groups, first a battleship, a cruiser and destroyers steaming towards the Forth, and another group approaching the Thames. The Red admiral concentrated his forces to intercept the attack on the Thames. In this he succeeded, but his fleet was withdrawn so as to allow an engagement between the Blue fleet and the shore batteries.

The Blue ships which were approaching the Tyne and the Forth were heavily attacked by Red aircraft. A Blue minelayer was bombed 90 miles eastward of the Firth of Forth.

On Friday one Red aircraft had engine trouble and landed safely in Holland. The exercises terminated at 10 p.m. on Friday.

ON PATROL IN A LONDON

WAR had been declared by midnight on Tuesday, June 19, and the Blue fleet were thought to have been at sea for four hours. Weather was not too good for reconnaissance, but the six Londons of 201 (G.R.) Squadron, swinging slowly round in the strong tide of the Tay were ready to take-off at a few mirutes' notice. Although the Tay seems to get any sticky weather there is about, the evening had been good and hot.

Moored on the water with the flying boats was the Power Boat launch, which had made very good time from Calshot, despite rough going. Her 40-odd knots would have been very useful if any of the boats had met with trouble out in the Firth.

Our quarters at Woodhaven were at one time the shore workshops of the training ship *Mars*, which used to be moored out in the Firth just below the Tay Bridge. A few unlucky ones found that the roof leaked over their beds, but for temporary quarters it was quite good, and the operations room had an excellent view of the water and pier. The dinghies needed good handling when the tide was running.

There was one patrol on the first night, but most of us got some sleep. Three Blue torpedo bombers attacked the boats at about 6 a.m. and no doubt gave some of the crews sleeping aboard an anxious few moments. The raiders were three Swordfish from the aircraft carrier *Courageous*.

Shortly after the attack two boats were ordered out on a coastal patrol—probably to scout for submarines. Reports of submarine attacks on merchant shipping had been received earlier. The dinghies soon put us alongside the Londons, and having received the O.K. we took off and flew in the direction of May Island. A non-combatant Hector flew beside us for a while.

The weather was excellent, but the wind was fluffing up the wave crests and the spotting of a submarine would have been very difficult. The wake of a periscope is like the foam on a wave crest but somewhat longer and straighter. The second boat of the patrol was about 20 miles ahead of us on the triangle as we rounded Bell Rock (of Inchcape fame).

Between May Island and St. Abb's Head we saw a Red vessel, also probably on an anti-submarine patrol; otherwise shipping was confined to a number of fishing vessels.

After about two hours "George," the automatic pilot, developed a leak and was given a rest; until then we had flown almost entirely under his control.

Some hours later we turned for home. Such things as the two wrecks on May Island and the fishing nets visible under water at St. Abb's Head had added interest to an uneventful patrol. Near the coast there was a moment's excitement when we saw in the distance some suggestion of a disturbance on the calming surface. It proved, however, to be a false alarm occasioned by the greed of certain gulls over a shoal of fish.

The tide was out as we flew up the Firth of Tay at about 1,000 feet, and below, on the sandbanks and in the clear water, a number of seals could be seen basking or swimming.

In our absence another attack had been made by three torpedo bombers, and the Wing Commander, from the H.Q. at Leuchars, had paid a visit. The refuelling launch, which took over as soon as we alighted, soon finished its work, and a new gyro was fitted in "George's" internal economy, so that in a minimum of time the boat was available again.

Orders for single boats for special duties were coming in regularly and routine patrols continued, so the serviceable five of the six Londons were in almost constant commission. The sixth boat had a leaky oil tank in course of replacement and another boat had a temporarily inoperative "George." The refueller hardly had time to fetch new supplies from Dundee, directly across the Firth, and at times boats were held up.

Chiefly as a precautionary measure two extra pilots were sent from Felixstowe, and duly arrived, with crew, in a Singapore.

Shadowing

After only an hour or so at the Base an order came through to take over the shadowing of the Blue Fleet, which had assembled some two hundred miles off the coast. It looked like being a long trip, so a few Thermos flasks of tea and some food were stowed on board. When carrying overload tanks, as were our six boats, smoking and cooking is forbidden as a precautionary measure. One bears up reasonably well, however, on fruit, biscuits, cold meat and chocolate.

To lessen the sea section, where there can be no marks to check up on, we flew down the coast to Sunderland and then turned out over the water.

Visibility was not too good, due to low clouds and mist, and on reaching the calculated position of the fleet we could find no sign of them. This was not sur-

prising, as the bearings given referred to a position and course some four hours previously, and their speed was only estimated.

We commenced a systematic combing round the position, and after a rather depressing hour in thickening weather, luckily spotted the Blue force, through glasses, in a brighter patch some ten or twelve miles away. Almost at the same time our wireless operator received the new position from H.Q.

It was a magnificent sight. The whole Blue fleet lay below us with splashes of evening sunlight on their grey-blue shapes. Battleships, destroyers, cruisers were just breaking away from what appeared to be No. 1 battle formation.

Forgetting for a moment we were supposed to be at war, we moved closer to get a better view, and at once searchlights, representing gun-fire were trained on us. Our orders were to shadow, so we sheered off and circled round out of range, watching the destroyers move to line abreast, and then turn and form up line ahead.

Until shadowing began we had left the flying almost entirely to "George," though it was necessary now and then to vary our altitude as cloud-base demanded.

The London is a very comfortable boat and was cruising well within her powers at about 85-90 knots (marine aircraft do not recognise "m.p.h."). The controls are quite light, but would naturally feel a little sluggish to one who is used to flying smaller landplanes. In the calm weather the machine is very stable and, in fact, flies itself. Take-off, complete with overload tanks, averaged from 30 to 35 sec., with a light wind.

After about an hour's shadowing, during which time we identified the various ships and reported their respective courses as they broke up into units, we were surprised to see an Anson come up beside us. We exchanged a few words by Aldis and the Anson flew off landwards.

Towards dusk we received the signal recalling us and set course for St. Abb's Head.

Twilight continues for a long time in these northerly latitudes, and at this time of the year it is dark for only about two hours. The first sign of land was the Longstone Lighthouse, flashing at 30-second intervals. Its position relative to our objective (which was some 25 miles north) seemed about right.

Refuelling from a tender off Newport on the Tay. In the foreground, mounted on the London, from which the photograph was taken, is one of the new-type Williamson camera guns.

A patch of bad weather obscured lights ahead and on the starboard side.

Another twenty miles brought us in right on St. Abb's Head, which, considering the fact that we had been out of sight of land for about five hours, spoke very well for the skill of our navigator. The wind had been quite light most of the time, but such an accurate landfall increases one's faith in the accuracy obtainable in drift measurement and general navigation. From time to time we had used the course-setting bomb sight set up in the front gunner's position, or dropped markers overboard for tail readings.

Weather reports were not good for the Tayport area and we had a good few miles more to cover. The Bass Rock light was not hard to find with its six evenly spaced flashes, and May Island was only a little more clouded.

Low Work

By the north shore of the Firth of Forth we were down to 100 ft., with a spot of rain to smear our screen. Another five minutes and we were even lower. At this point it seemed best to turn back, but a sudden small improvement encouraged us and we continued with the coastline to guide us until near Newport, and there, in a clear patch, put down.

We taxied in for the last mile or two, and, after a little manœuvring, moored up. A small, portable, self-contained searchlight is used from shore to pick out the moorings for the boats. The pinnace from Tayport, under control from Leuchars, had laid us a flare-path which was visible from time to time from the mooring. There are always a control officer, at least one boat crew, the flare party, dinghy drivers, fire picquet, and a telephone operator on duty at night.

A Walrus we had noticed when coming ashore had, we learned, brought the Group Captain on a visit from Montrose.

Several ships of the enemy fleet and some submarines had been reported and shadowed or attacked. There had been interceptions and naval engagements reported, and, in fact, the activities seemed to be near a solution. The early morning patrol on Friday was cancelled and the Blue ships were being withdrawn to new positions. Two boats were later detailed to locate and shadow enemy forces.

We took off about 7.25 a.m. and made out towards the reported positions of two cruisers. Visibility was difficult, due to dazzle from the bright early sun and to low cloud, and even to fog patches. The enemy was not located at once, although we met two separate Ansons returning home, presumably from the force we were to shadow. Our second boat reported that the two forces, theirs and ours, had come together, and later, just after they had separated again, we picked up our objective.

The sea was dead calm, and quite small steamers left a wake from horizon to horizon. Haze and clouds still made spotting difficult. Having reported the enemy ship we shadowed it, and after a time a searchlight played on us, showing that we had been noticed.

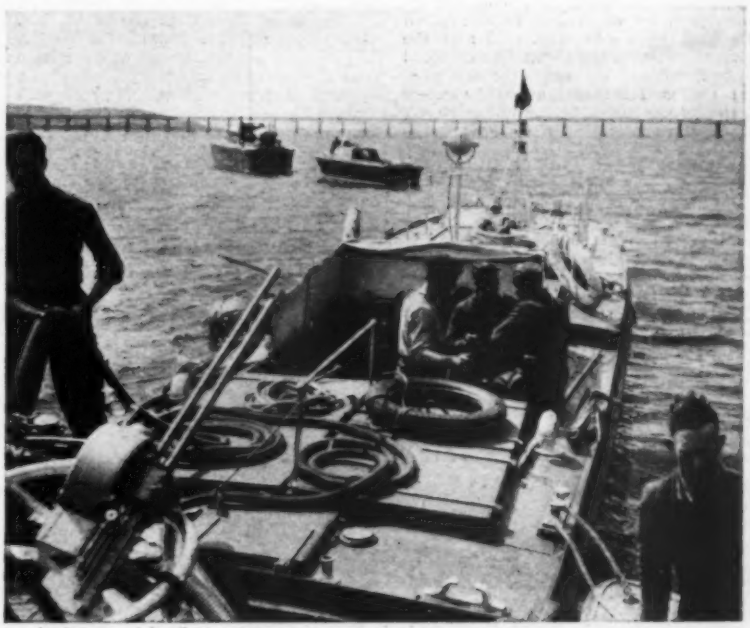
Almost at once came the order for us to attack. Open throttles and a little boost for the two Pegasus Xs took us quickly to 6,000 ft., from which height we dropped three bombs (actually smoke puffs from a signal pistol) and estimated two hits.

The attack was reported and shortly afterwards we were recalled. "George" was put in control and we settled down to a cold lunch. We had been out of sight of land for some hours, but made the coast within a few miles of the Tay mouth, passing almost over Montrose. Several squadrons of Ansons, a Magister and a number of Hart Trainers were distinguishable.

Coming over the sandbanks we took a few photographs and again saw a number of seals in the water. Weather was perfect and, judging from the shortage of flying boats on the water below, there was plenty of activity.

From the number of attacks and interceptions already reported it looked as though we had made our last trip of the exercises, which were due to finish at 10 p.m.

M. A. S.



WITH THE ANSONS

BAD visibility over the North Sea made approach extremely easy for the enemy fleet. Each pilot returning from reconnaisance had almost the same story to tell—of a glimpse of the sea immediately below the machine, and nowhere else. One spotted three submarines and proceeded to shoot them up with the greatest gusto—until he realised they belonged not to the enemy, nor even to his own side, but to a certain friendly foreign power, very real and quite unconcerned with the Exercises.

The position as indicated by the map in the local operations room at Bircham Newton at 18.00 hours on July 20, the first day, showed a force of four battleships and seven destroyers to be steering a south-westerly course some 150 miles east of Thornaby, Yorkshire. The last daylight patrol reported this force to be changing course for a more northerly one in order, presumably, to approach from a different direction during the night.

At two-thirty the next morning we made ourselves ready to take part in the first search of the day. The line to be patrolled was from the Tongue Light, near the North Foreland, to within ten miles of the Belgian coast; then back to the Tongue Light.

There seemed to be a little difficulty about the refuelling. The tanks on only one side of our machine were completely full, the tanker having run dry while filling the other side. To save time the machine was started up and taxied to another tanker, but was still unlucky, as the pump engine on this one would not start. However, we could wait no longer, as it was already 03.30 hours and zero time over the Tongue Light—our datum point—was 04.15. So our pilot decided to take off and do the patrol, calling in at Manston on the way back for more fuel if necessary.

Receiving the O.K. signal from the flare-path party, we made a good take-off into a moonlit night sky with just the faintest suspicion of dawn grey appearing, and set a course of 160° for the Tongue. It is always a fascinating experience to fly into the dawn and watch the birth of a new day. At first the navigation lights stand out like coloured fireflies keeping up with the machine, and the instruments are bathed in an amber glow from their illuminating lights. Later comes the phase when the navigation lights become attached to a faint grey outline, almost inseparable from its surroundings; and then the tricolour becomes gradually distinguishable. Inside the machine the luminous instruments of the prone bombing position, which are not lamp-lit, gradually lose their unearthly luminosity, as though some master hand were operating a rheostat.

But to return to the war. The datum point was reached with a few minutes in hand, so we cruised round until zero hour and then set a course of 90°. Visibility was not good, but for the first 35 miles or so ships close to our track could be seen; then everything was blotted out by 10/10 cloud at 0 feet—in other words, sea fog.

Turning at the end of the patrol line, we retraced our path towards the Tongue Light. At 05.30 hours, when within about ten miles of the Tongue, we spotted a cruiser of the *Southampton* class and two destroyers in line ahead on our port bow. By flying up their wake we found their course to be 80° and assessed their speed at 12 knots.

We shadowed them for some time before they shone the searchlight on us to simulate A.A. fire, and a Walrus came up and chased us away for a while.

Shadowing continued for 44 minutes in all and then we pushed off, with fuel considerations in mind. It was decided that we had sufficient to get us back to Bircham Newton, so a course was set for the coast and a correction made after a landfall, as we had wandered about a good deal while shadowing. Our E.T.A. at Bircham was 07.10 hours, and when we were nearly home, and already enjoying in anticipation a well-earned breakfast, we found the aerodrome to be covered with ten-tenths very low cloud; the stuff looked to be right down on the ground.

Fuel was by now running very low and the idea of playing around in a fog while an engine petered out did not seem a good one; so our pilot turned back some ten or twelve miles and forced-landed in a field near Wellingham. The maximum run was only about 300 yards and there was no wind at all. The boundary hedge was passed over with only 45 knots showing on the A.S.I. We had a few anxious moments while the Anson pitched rather violently across drainage undulations, which had to be taken diagonally, but she slowed up and eventually stopped with some fifteen to twenty yards to spare from the hedge. The weather closed in completely almost as we came to a standstill. A telephone message brought a lorry with fuel to the scene within about two hours.

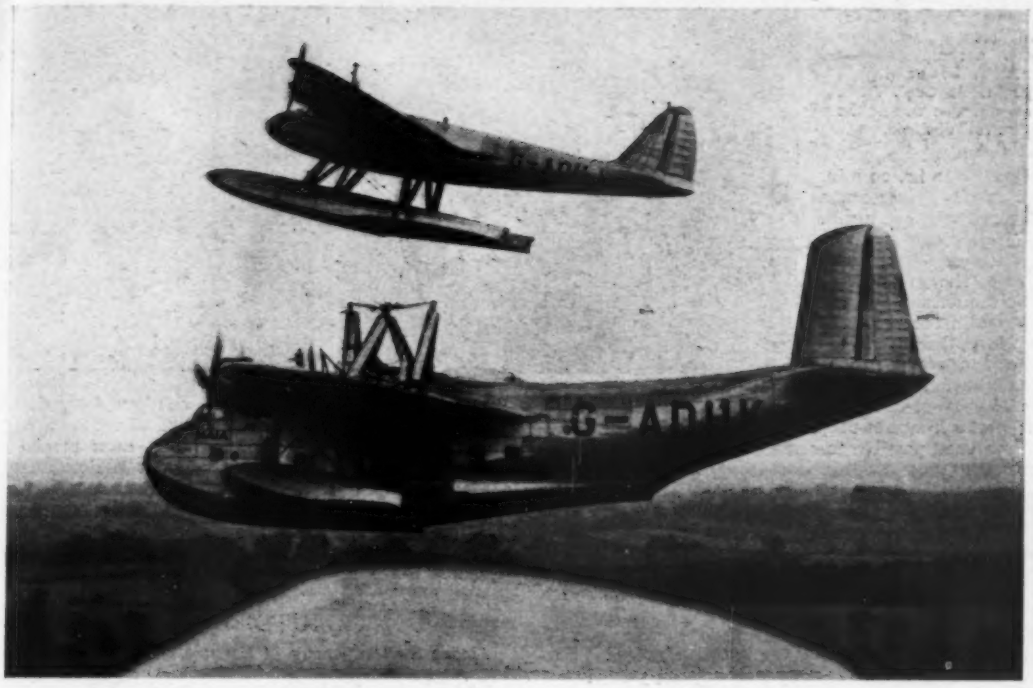
All dispensible load—passengers, parachutes and so forth—was then removed from the Anson and the wires protecting the throttle gate cut so that full bore could be given for take-off. With the pilot solo the machine just cleared the boundary hedge.

On arrival at the aerodrome we found the war had been called off until 18.00 hours to allow a new phase to develop; which seemed to be a good time to go home.

J. V.

Over an inhospitable ocean at 06.30 hours: an Anson navigator uses the hand bearing compass.

Near enough: The Anson at the end of its forced-landing run. Fog and fuel shortage were the causes of the bother.

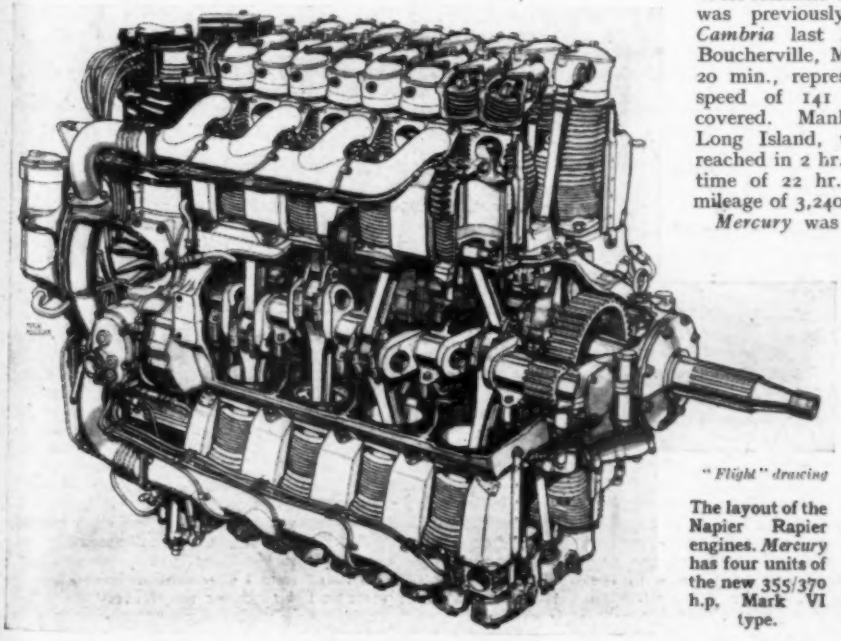


"MERCURY" MAKES GOOD

Upper Component's Crossing in Record Time Gives Mayo-Composite Scheme its First Commercial Vindication

WITH *Mercury's* record-breaking flight from Foynes Harbour, Ireland, to Montreal and New York, Imperial Airways, in conjunction with the Air Ministry (not forgetting the makers of the machine and engines), have achieved a second and most interesting step towards making transatlantic aviation a commercial proposition.

Mercury, Rapier-engined upper component of the Short-Mayo composite aircraft, was launched at normal all-up weight of 20,800 lb., including 600 lb. of freight—newsreels, Press photographs, and so forth. The separation from *Maia* was accomplished at 19.58 hours on Thursday, July 21. By passing over Cape Bauld, Newfoundland, 13 hr. 29 min. later, *Mercury* had made the fastest East-West Atlantic crossing on record (the best time was previously made by the Short boat *Cambria* last August, in 14 hr. 24 min.). Boucherville, Montreal, was reached in 20 hr. 20 min., representing an average "ground" speed of 141 m.p.h. for the 2,860 miles covered. Manhasset Bay, Port Washington, Long Island, was the next stop, and was reached in 2 hr. 11 min., making a total flying time of 22 hr. 31 min. for an approximate mileage of 3,240.

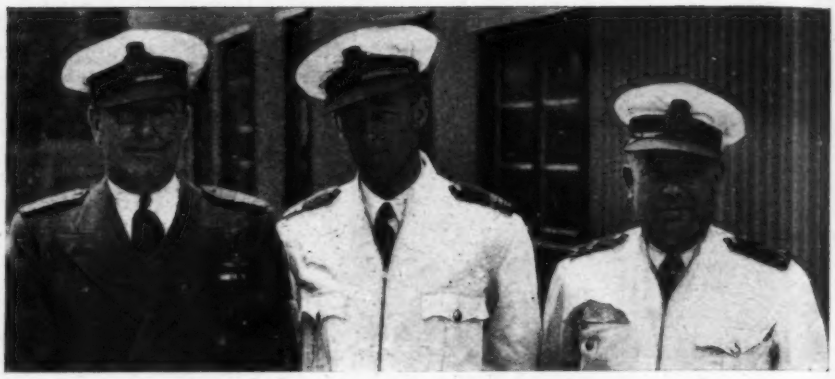


"*Flight*" *drawing*

The layout of the Napier Rapier engines. *Mercury* has four units of the new 355/370 h.p. Mark VI type.

Mercury was piloted by Captain D. C. T. Bennett, who was accompanied by W/O. A. J. Coster. Capt. Bennett's report is not yet available, but it appears from meteorological data that they encountered an average headwind of approximately 25 m.p.h. Several long stretches were covered against winds considerably in excess of this speed. The flight was made for the most part at altitudes varying between 5,000ft. and 11,000ft.

Interest centres, of course, on the 2,860-mile leg of the flight from Foynes to Boucherville, Montreal. *Mer-*



The men: Capt. D. C. T. Bennett (centre), who flew *Mercury*, accompanied by W/O. A. T. Cosier (right). On the left is Capt. A. S. Wilcockson, who was at the controls of *Maia*.

cury's time of 20 hr. 20 min. for this stretch represents a ground speed of 141 m.p.h. Taking into consideration the headwinds, it would appear that the average air speed for the actual Atlantic crossing was in the region of 177 m.p.h. On arrival at Montreal there were 80 gallons of fuel left in the tanks. The fuel consumption on this flight had been at the extraordinarily low rate of 54 gall./hr., at which figure it would have been possible to continue for at least an additional 250 miles and still leave a reasonable margin for safe landing circuits.

This economical fuel consumption, coupled with *Mercury's* high cruising speed, gives some indication of the efficiency of the four 355/370 Napier Rapier Mark VI engines. The range and speed are a long way in excess of the original requirements. The guaranteed performance was 2,350 miles to be covered against a 40 m.p.h. headwind at an air speed of 140 m.p.h. when carrying 500 lb. of mail. Actually, the pay-load of *Mercury* has proved to be 1,000 lb. for this distance. In fact, she has proved that she could do considerably more than the 2,000-mile Atlantic crossing against a 60 m.p.h. headwind.

Looking back for a moment to the broad principles of the Short-Mayo scheme, it is interesting to remember that *Mercury's* C. of A. for an unassisted take-off allows only 14,000 lb. maximum weight, whereas when launched in the air by *Maia* the permissible weight is 20,800 lb.—a difference of 6,800 lb., the whole of which is available for additional fuel and pay-load.

A feature of the composite which is sometimes overlooked is that the lower component, when not required for launching, can be utilised for normal flying purposes, and in this connection *Maia* carried ten passengers with luggage on the flight from Southampton to Foynes immediately prior to *Mercury's* departure on the record flight.

The Short-Mayo composite aircraft was fully described in *Flight* of February 17, 1938, since when, with one important exception, few changes have been made. The Napier Rapier Mark V sixteen-cylinder H-type air-cooled engines originally fitted to the upper component have been replaced by a more powerful version of the same type—the new Mark VI, which has a normal output of 355/370 h.p. at 3,650 r.p.m. and 4,750ft. The maximum power rating is 380/395 h.p. at 4,000 r.p.m. at 6,000ft. Two-bladed wooden airscrews are employed.

CONTRIBUTORS TO SUCCESS

Among the components of *Mercury*, and of *Maia*, the Bristol Pegasus-engined mother-ship which launched her on her successful voyage, were the following:—

Airscrews, v.p. and wooden, by De Havilland and Airscrews, Ltd., respectively; Rotax magnetos and Lucas electrical equipment; K.L.G. plugs with BR90 resistor elbows; cables by British Insulated Cables and Callenders; smaller electrical details, D.H. Bonnella; Salter springs; Britannia batteries; copper tubing by Birmingham Battery and Metal Co.

Instruments, general, by Smith's Aircraft Instruments; Marconi radio—AD 67A transmitter, AD 6872B receiver and 5062E D/F. receiver; Sperry auto pilot and artificial horizons; controls by Exactor, Arens and Bowden.

Constructional materials by British Aluminium Co.; Sterling Metals; Phosphor Bronze Co.; J. J. Habershon; Firth-Vickers; Northern Aluminium Co.; L. Cameron and Co.; High Duty Alloys, Ltd.; Jas. Booth and Co.; Reynolds Tube Co.; Accles and Pollock; F. A. Hughes.

Jointings by Cork Mfg. Co.; rivets by S. and R. J. Everett and by De Bergue's patents; rubber sections by Expanded Rubber Co.; alloy spinnings by Cornercroft, Ltd.; window and door fittings by Beckett, Laycock and Watkins; Bakelite sheets by Bakelite, Ltd.

A.G.S. parts by Rubery, Owen and Co., and by Vickers (Aviation), Ltd.; special machined parts by S. E. Opperman; Simmonds elastic stop-nuts; upholstery and decorations by Rumbold.

Shell fuel and Intava Red Band oil.

Final Gliding Contest Results

THE final award of points in the Open Contest at the National Gliding Contests had to await the examination of the last day's barograph records, so that points for height might be added to the provisional figures already given in *Flight*. The Rhönsperber sailplane, flown by C. Nicholson and J. P. Dewsbery, comes out top with 464 points; next in order are King Kite (Sqn. Ldr. P. M. Watt), 459½ points; Rhönadler (J. S. Fox and P. B. N. Davis), 413 points; and Minimoa (P. A. Wills), 332½ points.

Clean Hands—Without Water

SOLD in an attractive leather pouch at the modest price of 2s., a new hand-cleanser known as "Palpak" is claimed to clean dirty or greasy hands efficiently without the use of soap or water. The pouch contains a large tube of the preparation and a supply of paper towels.

We have tried a sample, and the inventor's claims appear to be fully justified. "Palpak" is obtainable at the principal London stores and from leading garages.

Air League A.G.M.

LORD MOTTISTONE, presiding, on July 20, at the annual general meeting of the Air League of the British Empire in the absence of the Duke of Sutherland, said, in proposing the adoption of the report for 1937-38, that the League had had a very successful year. The 1938 Empire Air Day had been a greater success than any previous Day in spite of the unfavourable weather, and new records had been made in the total attendance and in the amount to be distributed to charities.

Twelve units of the Air Defence Cadet Corps had already been formed, and if all went well at least fifty of the two hundred units aimed at would be established by the middle of next year.

The committee had approved a policy of closer co-operation with the Navy League, and this policy had been made public in a letter signed by Lords Lloyd and Beatty of the Navy League, and by the Duke of Sutherland and himself on behalf of the Air League.

In conclusion, Lord Mottistone declared that the need for an active and vigorous Air League was as great now as ever, and he assured members that the President and the members of the Committee would never for one moment relax their efforts for the good of the League and of the country.

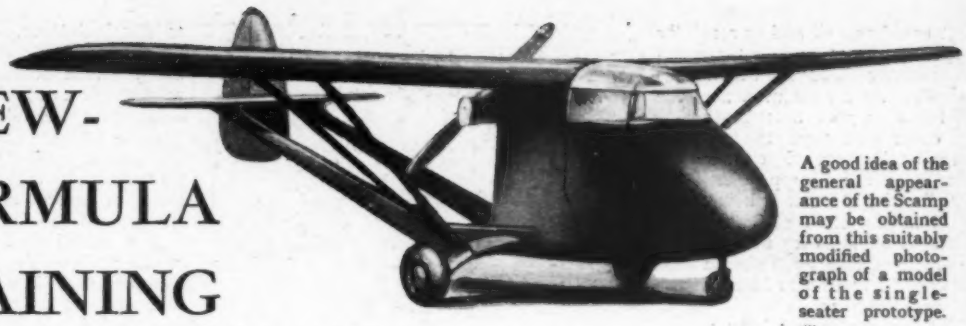
The report was adopted unanimously.

Expansion at Hanworth

GENERAL AIRCRAFT have concluded arrangements for the purchase of the buildings, plant and stock of the British Aircraft Manufacturing Company at Hanworth Aerodrome. The reorganisation of the existing equipment and installation of new machinery is to be put in hand immediately in order to relieve pressure on the General Aircraft works, which, of course, are adjacent, and to provide further factory space for new sub-contract work.

The concreted area separating the two works needs only to be roofed over to provide an additional assembly hall. This, in turn, will lead directly to another hall on the edge of the aerodrome and provide facilities for the final assembly of larger military or civil aircraft than are yet contemplated. The key men of the British Aircraft organisation have already transferred their services and work in the new factory will start immediately.

NEW-FORMULA TRAINING



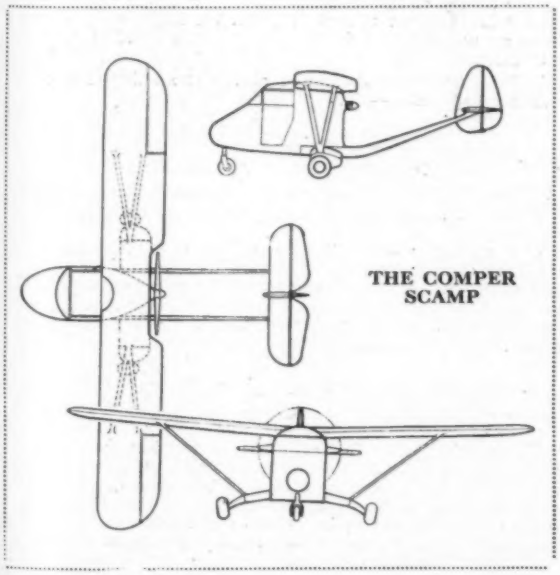
A good idea of the general appearance of the Scamp may be obtained from this suitably modified photograph of a model of the single-seater prototype.

Preliminary Details of the Comper Scamp : A High-wing Pusher with a Tricycle Undercarriage : Intelligent Anticipation

DURING the past year or two there have been a number of attempts to produce a machine which will be both cheap to manufacture and easy to fly. It seems that one or two of them may even yet succeed in weathering the storm of criticism and in crushing the wall of simple conservatism. Nowadays, with the certainty that, under the Air Guard scheme, the clubs will shortly be receiving additional financial assistance, the outlook for the patient manufacturer of a really good lightweight is much more rosy.

In his new machine, which, in prototype form, is well on its way towards completion at Brooklands, Flt. Lt. Nicholas Comper has endeavoured to produce something which is not only cheap in first and later costs, and practical in performance, but which has as many strong points as possible in its favour as a device for primary training and early solo flying. Furthermore, it is modern in conception in that it is a pusher with a three-wheeled undercarriage—though the latter may not be fitted to the production type until civil and Service training establishments are quite ready for the tricycle cult.

Although in detail construction the Comper Scamp, as it is known, is simple and conventional, quite a number of ingenious features are incorporated in the design as a whole. For instance, the primary structure consists of two keel members which take all the loads and to which the tail-carrying booms are attached to form continuations. At right angles to these keel members is another which forms the second part of the basic structure and has a number of important uses. This member, which is curved downwards on either side of its centre point, carries the undercarriage. It is, at the same time, a stub wing giving a certain amount of lift, and its ends form the "take-off" point for the wing strut attachments so that a much more satisfactory angle is obtained for these struts. The keels, of course, carry the engine mounting and centre-section superstructure as well as the cabin, which, as it is not part of the structure, can be designed for maximum view and convenience.



THE COMPER SCAMP

The undercarriage itself is both simple and cleverly conceived. The wheel axles are attached to what may be considered as the wing tips of the stubs. These tips are hinged at the top and are held at the bottom by shock-absorber cord. When the machine is on the ground this cord is to some extent stretched and the stub tips are out of line with the stub wings themselves. When, however, the machine is airborne these tips become, aerodynamically, extensions to the stubs, so that in one fell swoop a great deal of the undercarriage drag, as such, is removed. It will be realised that the downward droop in the stub member is sufficiently pronounced to give ample ground clearance, yet not so that its aerodynamic qualities are impaired. The nose-wheel is of the simple castering type. Other than a movement in the position of the stub member, no structural changes will be involved in conversion to conventionality in the matter of undercarriage arrangement.

The booms carry a cantilever tail-plane and a single central rudder, which, lying as it does directly in the slipstream, should provide ample control on the ground. The booms themselves are laminated to provide the necessary curve and are the only parts of the structure which may be considered in the least expensive to produce. The two-spar wing, with ply-covered leading edge, is absolutely conventional and is similar in construction to that of the Comper Swift. The section is N.A.C.A. 23012.

Whys and Wherefores

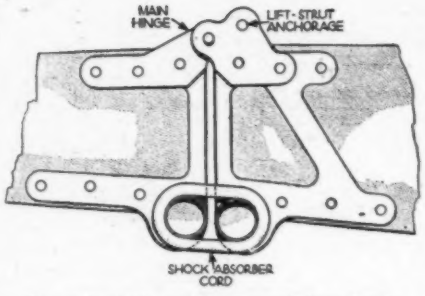
Flt. Lt. Comper has chosen the high-wing arrangement not only because it is more suited to a pusher design, but also because this arrangement is, in itself, a guarantee against vicious qualities. The pusher scheme was selected mainly because of the good view obtainable and because of its advantages in dual instruction. Additionally, however, if the Scamp is ever considered as a primary trainer for more serious military and civil flying, the pupil will, through it, have become accustomed from the very start to the idea of flying without a pronounced datum line.

The first machine, which is at present being built by the students of the College of Aeronautical Engineering at Chelsea and Brooklands (and providing really creative instruction for them) is a single-seater and will be fitted with a Praga B flat-twin. The two-seater production type, which is being built concurrently, will probably be fitted with a Walter Mikron straight-four in its prototype form, while later machines will be fitted with a British engine of similar power. If the production machines are

constructed as well and as carefully as the initial single-seater there will be nothing about which to grumble. As for maintenance, the Swift has as good a reputation as any other civil type to be built, and a similar record can be expected for the Scamp. Incidentally, the single-seater is being built to the special order of Capt. Fane, who ordered the very first Pobjoy-Swift; it will be remembered that the original Swift was fitted with a flat-twin Scorpion.

The two-seater will have a span of 30 ft. and an overall length of 18 ft. 9 in. Every part which has so far been built has proved itself under test to have a more than ample factor of safety, and the weights are coming out according to calculations. Performance figures have not yet been released, but the idea behind the design is to produce a machine with an exceptionally good take-off and climb, yet one possessed of a useful cruising speed. There seems to be no reason why it should not be possible to make and to sell the machine at the figure of £400.

The initial test flight will be made at Brooklands by Flt. Lt. Comper, and Capt. Duncan Davis will continue the good work so that the machine, in its final form, will be what is wanted from the instructional point of view. Now that the Civil Air Guard scheme has been publicly announced, one can also say that the design shows intelligent anticipation.



The undercarriage of the Scamp is ingeniously economical both in cost and head-resistance. This sketch shows the way in which the movement and springing is arranged. The stub layout as a whole will be seen in the general arrangement drawing on the previous page.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

AN INTERNATIONAL LANGUAGE FOR AVIATION?

Plea for Esperanto

IT is a well-worn commonplace in 1938 to say that the world has shrunk to small dimensions; that the advent of aviation and aerial traffic has annihilated distances and brought the peoples of the world in much closer contact with each other. The shores of the Atlantic Ocean have closed upon each other to a distance of 12 hours, Africa can be reached from London in 8 hours, and the farthest continent—Australia—in 3 days. We who are connected with this aerial business* are justly proud of having brought about this change, but our pride receives somewhat of a shock when we realise how strange we feel in the new surroundings which we have reached at such enormous speed. On landing there we find ourselves surrounded by people whose outward aspect may be quite pleasing, but whose spiritual make-up we cannot penetrate because they express it in a language we do not understand. We have developed a technique to transport our body to within close distance of any nation of this world, but our spirits remain as apart as the poles.

The contradiction appears greater still in that, while soaring in the air miles above a strange country whose population is invisible to our eyes, we are able to intercept with our physical ear the multitude of sounds and speech sent into space by our sister invention—radio—without, however, being able to penetrate their meaning. Often we cannot even decipher messages, such as weather reports, orientation definitions or aerodrome warnings, specifically intended for our benefit, and this because we cannot understand the language in which they are broadcast.

Would it really be too much to hope for the existence of a common world language, used by all radio stations on the air routes? It would be too optimistic to expect that this common code or language will be spoken by everybody—at least, not for many years to come—but it appears most desirable that it should be mastered to a greater or lesser degree by those individuals who are directly concerned with aerial traffic, or who, for any other reason, are likely to come in contact with foreign travellers. Similarly, all printed communications, traffic and postal regulations, etc., might be expressed, in addition to the language of the country, in this international language as well.

A common code would also be of value to the private aircraft owner to whom a week-end trip to a foreign country still represents an adventure—less because of the hazards of actual flying than because of lingual difficulties.

Not only the travelling public, pilots and air-traffic companies would benefit, but also the aeronautical scientist and the aircraft constructor. Air science is now truly international. New inventions and ideas, novel constructional advances are not restricted to one country, they spring up here and there, and are accepted or rejected by the whole world. But the spread of the actual ideas is very much retarded by the diversity of languages in which the principal scientific reports are published. With the introduction of a common language, all official reports, publications, patent specifications, etc., could be understood universally, and one can also visualise a flood of text books, treatises and periodicals in this language which would undoubtedly find a wide international market.

The above must lead one to the inevitable conclusion that, for the victorious and unchecked development of aviation in its many-sided aspects, the introduction of an auxiliary international code or language is absolutely essential. The only solution rests with a "new" language, neutral to all, giving no national preference or cause for national jealousy.

To the knowledge of the writer, only one such language now exists—Esperanto—and very promising claims are made for it by its advocates, both as regards the speed as well as the ease with which its mastery can be acquired by any average European. Judging by the results of ordinary broadcasts in this language by a number of radio stations, it is euphonious and clear sounding, and its reception is not likely to lead to confusion or error—certainly less so than an entirely artificial code system. Before, however, it can be advocated for the use described above, a careful examination will have to be made as to whether its construction and vocabulary lend themselves efficiently for our purpose, and what changes, if any, may be required to make it suitable.

This is a task for specialists and an appropriate committee may have to be set up for the purpose by suitable bodies, such as the Royal Aeronautical Society, the British Air League, or even by Imperial Airways, and if a favourable conclusion is reached by this body, then steps will have to be taken to obtain international acceptance. The arguments given above apply even more strongly to Central European air traffic conditions than to our own, and therefore it is to be hoped that, for the benefit of the industry and as a powerful ally for the further development of aerial science, the ideal may soon become an accomplished fact.

M. LEWIN.

Cricklewood.

[* Our correspondent is head of the stress department of Handley Page, Ltd.—ED.]

RADIO OPERATORS

Training Periods Advocated

AT this time of the year quite a number of inexperienced radio men usually obtain employment with air operating companies.

Any matter connected with safety of navigation and efficiency of communications is of vital interest to this Union, and we suggest that companies employing these men should endeavour to give them at least fifty hours in the air as supernumeraries before they are allowed to act as sole radio officers on aircraft.

A. D. CRISP,
Secretary, Aircraft Section,
Radio Officers' Union.

In Brief

Two youthful enthusiasts wish to correspond on aviation and allied subjects with kindred spirits abroad. Sixteen-year-old Peter Hitchings, 173, Cavendish Road, Bispham, Blackpool, seeks contacts in the United States and the Dominions; Arnold Manton (17 years old), 17, Hazlemere Gardens, Worcester Park, Surrey, wants correspondents in Australia, New Zealand or South Africa.

July 28, 1938. Supplement to FLIGHT

THE AIRCRAFT ENGINEER

No. 150. (Volume XVI No. 7) 13th Year July 28, 1938.

FUEL SUPPLY SYSTEMS IN AIRCRAFT

Some Notes on Guarding Against Vapour Locks

By E. W. KNOTT, M.I.A.E., M.S.A.E.

THE layout of the complete fuel supply system, especially in large aircraft, is a subject involving many difficulties. The number of separate tanks, their disposition in the aircraft and their positions relative to the engines they feed add to the complexity of the problem. The volatile nature of the fuel in general use (excluding diesel-engined aircraft), changes of air and fuel temperature and the altitude at which the machine may be flown increase the risk of failure of fuel supply unless extreme care is taken with every detail, no matter how seemingly trivial.

Fuel Variations

Aviation fuel is a mixture of hydrocarbons of no fixed proportions. The various constituents, among them being heptane, octane, hexane, toluene, etc., have varying vapour tensions, and as the proportions of these constituents vary with the place of origin, length of storage and degree of refinement, the composition of any aviation fuel is liable to no inconsiderable variation. Fuels mostly contain inflammable gases such as propane and butane held in solution by atmospheric pressure, and, in addition, air is also soluble in petrol.

It has been found that in closed reservoirs the composition of the fuel varies with the relative proportion of the space occupied by the fuel and the space above it in the tank. If the space above the fuel is small relative to the tank volume, it is composed of the more volatile elements of the fuel, but if the space is large, the heavier fractions will also be present, so that the composition of the vapour in the tank will depend on the ratio between the volume of vapour and the volume of petrol.

Fig. 1. Layout of the test rig described in this article. Provision was made for simulating altitudes from ground level to 6,000 m. (19,700 ft.)

Fig. 2. At ground level there was no sign of bubbles in the fuel pipe.

At any given pressure, e.g. atmospheric, the various constituents will be given off in the form of vapour at definite temperatures, and a reduction in pressure will lower the relative temperature at which not only fuel vapour is released but also dissolved gases. This basic principle probably causes more trouble in fuel feed systems than any other, and is apt to make itself evident wherever the fuel pressure is reduced below ground atmospheric pressure, such as occurs on the suction side of fuel pumps, and in the more vertical parts of the piping layout during sharp turns where centrifugal force—as high as 3 g—can make itself felt. If this vapour is allowed to collect anywhere between the tanks and the carburettor float chambers, so-called vapour locks may occur, and, by breaking up the continuity of the fuel column, cause temporary or complete engine stoppage.

Apart from the causes mentioned, based primarily on physical laws, there are others that may pardonably be called mechanical causes. These are—in suction pipes—long horizontal sections, humps, pockets, high points to which the piping reaches and then falls and sudden changes in velocity due to acute alteration in sectional area of piping or the introduction of fittings such as filters, cocks, non-return valves, etc.

Figures 1 to 5 show some interesting tests taken by the Etablissements A.M. in France on the effect of altitude conditions in horizontal fuel pipes in which there is a suction head. Fig. 1 shows the general layout of the test apparatus, the fuel pump being on the right, with a horizontal glass tube fixed to the suction inlet. The other end of the tube was taken to a tank 3 metres below the pump and the utmost care taken definitely to avoid all possible air leaks. Fig. 2 shows the pump under ground level conditions drawing petrol in a continuous column

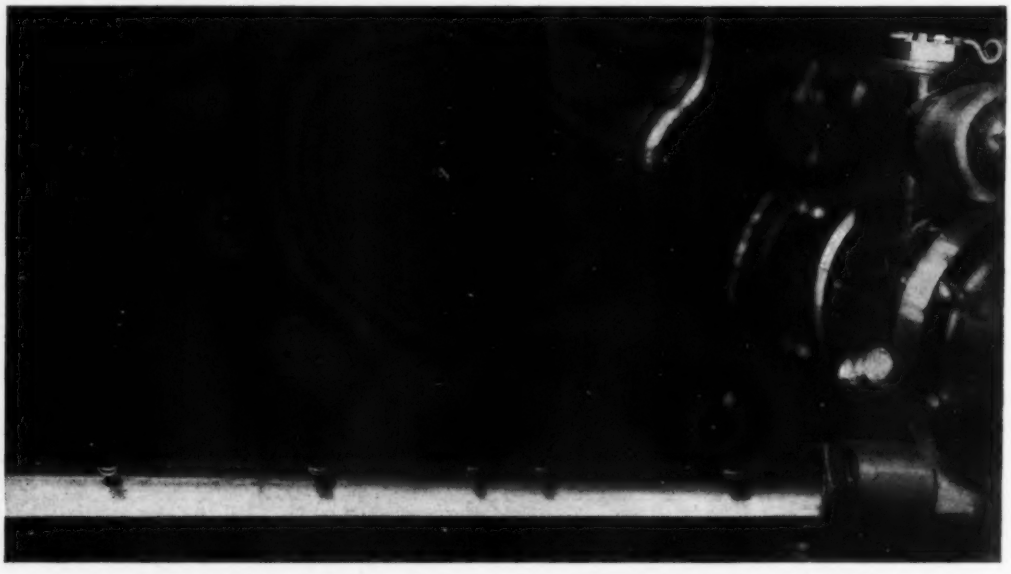


Fig. 3 shows bubbles beginning to form at a pressure corresponding to 2,000 m. (6,560 ft.)

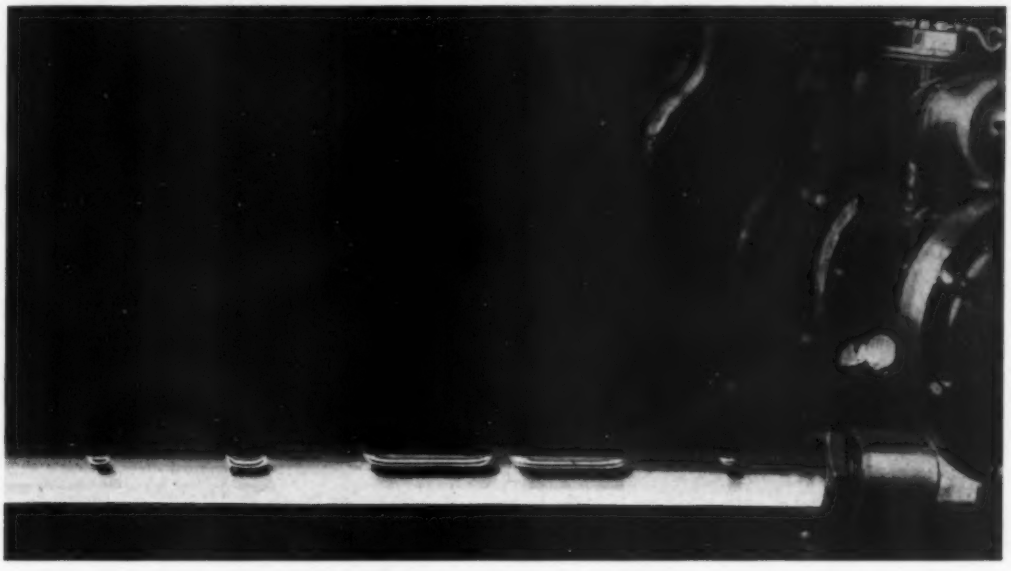


Fig. 4, corresponding to 4,000 m. (13,100 ft.), shows a strong formation of bubbles.

through the glass tube. In Fig. 3 a depression equal to an altitude of 2,000 metres was simulated and it will be seen that small bubbles of vapour have begun to form.

Altitude conditions equal to 4,000 and 5,500 metres are shown in Figs. 4 and 5. When taken to approximately 6,000 metres, the fuel column became completely ruptured and the pump failed to function as a result of this. Tests taken in actual flight by inserting glass tubes in the fuel feed system have confirmed this formation of vapour, which has caused and still is causing numerous forced landings.

Gravity feed systems in which the fuel in the pipe lines is under a pressure head are, in correctly run piping, free from vapour locks, and by " correctly run " is meant a gradual fall from tank to carburettor and devoid of local heating by exhaust or oil pipes and hot air from the engine. Gravity systems in their original simplicity are to-day practically non-existent and petrol pumps are a standard fitment on all but the so-called " pop-bottle " motors.

The pumps, while in themselves efficient, are handicapped by the fact that, being mechanically driven and bolted to the engine, they become hot and transfer some of their heat to the fuel passing through them.

Rate of Climb

Yet another factor has arisen in later years. The high rate of climb of certain aircraft has brought into being troubles that did not occur a decade ago. There are in production to-day aircraft which climb to 10,000 or 20,000 feet at speeds which a few years ago would have been described as incredible or dismissed as impossible.

Let us take the case of a machine taking-off with fuel at say 16° C. and climbing to 10,000 feet in 5 minutes. The surrounding temperature has dropped to approximately

Fig. 5, taken at a pressure corresponding to a height of 5,500 m. (18,000 ft.), discloses an almost continuous air space in the pipe.

−5° C., a fall of 21° C., whilst owing to the short time elapsed the fuel temperature has only dropped 2 or 3° C. Hence the fuel temperature is approximately 18 or 19° C. higher than the surrounding air, a definite incentive to the release of dissolved air and natural vapour. In addition the surrounding air pressure has, in round figures, dropped from 30" Hg to 20" Hg, and this combination of reduced temperature and pressure causes at the slightest provocation a discharge of vapour in the same way as is evident when the stopper is removed from a charged mineral water bottle.

The question of temperature difference can be minimised to a certain extent by having the piping exposed or near the skin of the aircraft, but one salient necessity remains, and that is the complete avoidance of suction heads anywhere in the fuel supply system.

Location of Fuel Pumps

Attempts have been made to isolate the pumps from the engines and at the same time reduce their suction heads by driving them with flexible shafts, but except in short lengths, straight runs and low duty conditions, they are by no means perfect.

It is obvious that the only satisfactory method is to place the pump at some level below the lowest tank so that the pump is what is commonly described as "drowned." There will then always be pressure throughout the fuel supply piping and the danger of air being drawn into the pump from an emptied tank is minimised.

Remotely Operated Pumps

Pumps operated at some distance from their prime source of power have been tried and can be classed as follows :—

(I) Mechanical drive by a reciprocating or rotary flexible shaft.

(II) Hydraulic drive from engine-driven pump.

(III) Pumps driven by electric motors obtaining their motive power from generators, either driven direct by the engine or by a small separate power unit similar to a self-contained air compressor unit as in (V).

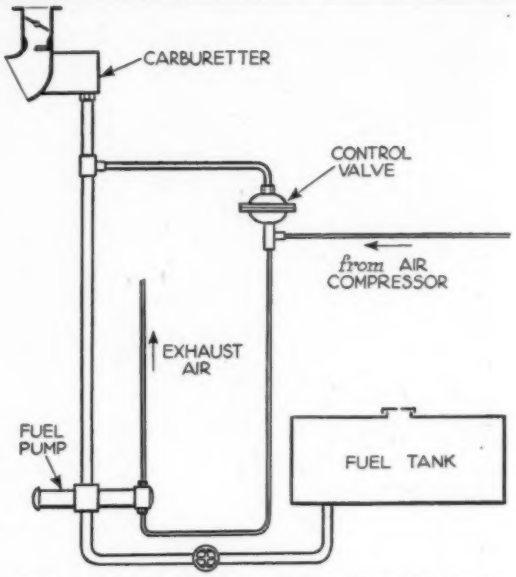


Fig. 6. Layout of fuel pump, control valve and carburetter.

The Hobson compressed air operated fuel pump and its control valve is a remote-acting pump that has passed official tests, is self-regulating and can be installed anywhere in the aircraft, the only connection between it and the engine being a single low-pressure pipe line, the exhaust air being discharged overboard. It functions either in a vertical or horizontal position and if centrifugal force lowers the fuel pressure in the pump feed pipe, the control valve instantly speeds up the pump to regain the correct pressure. Air can be obtained free of cost in unlimited quantities, is non-inflammable and is, therefore, an ideal source of motive power, and if such a pump is placed below the lowest fuel tank, nowhere in the system can a negative pressure exist in the fuel lines. Fig. 6 shows the layout of this pump and control valve. The latter controls the compressed air supply to the pump and is itself controlled by the fuel pressure below the float chamber needle seat in such a way that the greater the demand of fuel from the float chamber the faster the pump operates, the pressure at the needle seat being kept within a limit of $\mp \frac{1}{2}$ lb. per sq. inch of the desired pressure. The volume of free air used per gallon of petrol pumped is slightly over 0.4 cubic foot, the pressure required is approximately 10 lb. per sq. inch above the pressure head to which the pump is delivering fuel and its capacity is 2,000 h.p. with some reserve for pumping from one tank to another at the same time. Fig. 7 shows the actual pump and control valve, the overall length being $10\frac{1}{2}$ inches and the total weight 7 lb.

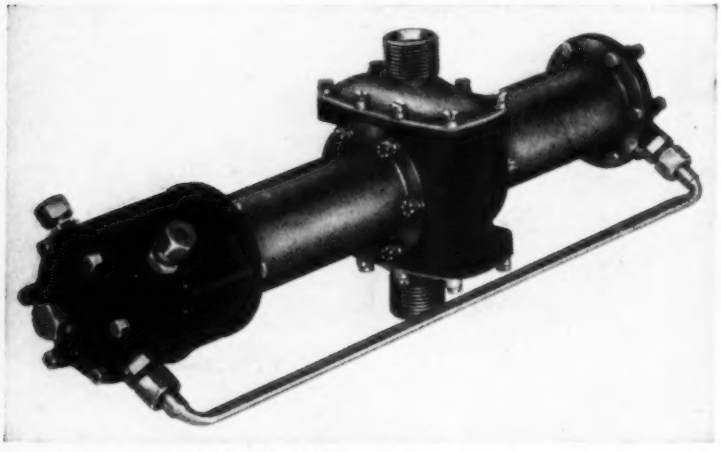
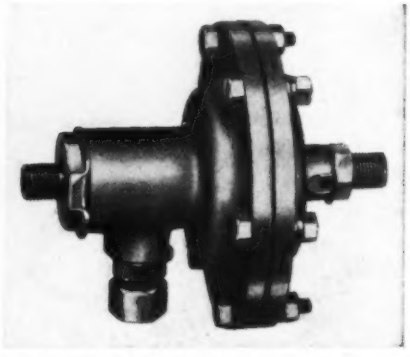


Fig. 7. The Hobson fuel pump (left) and control valve.



(IV) Pumps of the windmill type, i.e., driven by a small propeller, the pumps being mounted in such a position that they are in the propeller slip stream.

(V) Compressed air drive from engine-driven air compressor or a small motor-driven air compressor.

Method (I) is not satisfactory, especially in large aircraft. Method (II) has been tried and abandoned. Method (III) adds to the already complicated wiring system, is costly and heavy and the motors must be of the flame-proof type. Method (IV). These are reasonably satisfactory, but are subject to adverse climatic conditions and are projections which are unpopular on present-day high-speed aircraft. Method (V) is proved to be satisfactory, light in weight and with the increasing use of engine-driven air compressors are particularly adaptable to aircraft, especially those of large dimensions.

CORROSION-RESISTING MATERIALS

A Review of Those Relevant to Aircraft Construction

By FRANCIS A. FOX, M.Sc.*

THE corrosive media acting, or liable to act, on the metallic parts of aircraft are numerous. Moisture, oxygen and carbon dioxide exist almost universally in any atmosphere. In addition to these, chlorine compounds are present over and near the sea, and sulphur compounds are important factors in atmospheric corrosion in smoky manufacturing areas. Seaplanes are acted upon by sea-water itself, while cylinder walls may be liable to rapid corrosion at high temperature and humidity. Special cases of atmospheric pollution add further corrosive agents to this formidable list.

There are two classes of metals which are inherently capable of resisting corrosion to a greater or smaller extent. These are :—

1. Those metals with little tendency to pass into solution—i.e. those with low solution pressures—the " noble " metals. Copper, for example, has less tendency to combine or go into solution than iron. The electro-chemical series is an arrangement of the elements in the order of their solution pressures, and from this a general idea of the tendency of metals to corrode may be formed. In specific cases, however, which may be complex, a consideration of the electro-chemical series may not in itself be sufficient to enable predictions as to behaviour to be made.

2. Those metals which form protective oxide films. Such a film, itself the result of tarnish or corrosion, may prevent further access of the corroding agent, may be sufficiently strong and flexible to maintain its continuity under conditions of stress, and may be self-repairing in the event of temporary damage. A film of this sort may confer outstanding corrosion-resistant properties on the basic material. A material which owes its immunity to an oxide film must, however, only be used under conditions in which the film can maintain itself chemically. For example, in oxidising conditions, chromium (and chromium alloys), though it has a much higher combining power than silver, will preserve a metallic surface much more readily than silver. Under reducing conditions, however, where the oxide film cannot persist, chromium will decompose, while silver will be unchanged.

As distinct from these two classes, there is another category into which materials suitable for use under corrosive conditions may fall, and this is : materials which are not themselves corrosion-resistant, but which may be used when suitably protected from the form of attack likely to be encountered. Such protection is plating, spraying, lacquering, " sherardising," etc. In the case of metallic protection the relative positions of protecting and protected metals in the electrochemical series is of importance. For example, chromium and nickel have high corrosion resistance, and when plated on iron confer this quality on the combined product *so long as the plate forms an unbroken layer*. If the iron is exposed, however, even at pores or small cracks, the presence of the " protecting " nickel or chromium accelerates corrosion of the iron at these points, and rust " bleeds " out from the pores. Cadmium and zinc, on the other hand, do not behave in this way towards iron when exposed at discontinuities ; they actually tend to prevent corrosion of the iron, and they themselves are " sacrificially " corroded.

Before proceeding to a review of those materials revelant to aircraft construction which are best able to resist corrosion, some reference may be made to the different types of corrosion which may be encountered.

These can be indicated as follows :—

(*a*) Bi-metal " galvanic " attack.
(*b*) Pitting.
(*c*) Concentration or solution cells.
(*d*) Corrosion-cracking (" season " cracking).
(*e*) Corrosion-fatigue.

* The author is a lecturer at the Birmingham Central Technical College.

(*a*) *Bi-metal "Galvanic" Attack*

This type of corrosive attack is well known as it is connected with the simplest form of electric cells ; it is due to the corroded metal having been electrically connected to another metal under corrosive conditions. Because it is so well known, it is generally thought that this action must necessarily be severe, and that two dissimilar metals in contact must inevitably corrode rapidly. In practice, however, there are various factors which modify this viewpoint, and under many sets of conditions no accelerated corrosion is produced at all. For example, the circuit must be complete through the metals and also the corrosive solutions : metals are good conductors, but there may be considerable resistance in the solution and in metal contacts ; accumulation of corrosive product also may have an insulating effect which will stop the action. This effect can, of course, be intensified by the deliberate insulation of the dissimilar metals (if the design permits) by a non-conductor such as pitch, shellac, red-lead paint, marine glue, or by varnished fabric.

The electrochemical relation of the two metals is, of course, of great importance, and if one is much more " noble " than the other, the galvanic tendency will be enhanced. Where the metals are near to each other in the electrochemical series, however, the effect is not great. For example, Magnesium in contact with copper will readily form a galvanic couple ; Magnesium in contact with Aluminium, however, forms a combination the galvanic action of which is not likely to be so severe. " Polarisation " effects due to the evolution of gases at the surface of one of the metals may also tend to slow down galvanic action. Where there is considerable difference in the areas of the two metals in contact, the action will be influenced ; a larger area of " noble " metal produces more rapid corrosion on a small area of " baser " metal. For example, a steel rivet in copper sheet is rapidly corroded ; but a copper rivet in a steel sheet will produce little corrosion except at the contact.

(*b*) *Pitting*

Pitting is a common form of corrosion, in which the attack is localised in a number of sharply defined areas ; it is usually associated with the formation of solid corrosion products which are located at or near the site of each pit. Pitting may be due to a variety of causes, one of the most important of which is lack of homogeneity in the metal. The heterogeneous particles or inclusions, under favourable conditions, may cause the formation of local galvanic couples ; if there are inclusions which are permeable to the corroding fluid (even to moisture) there may form a pocket which can contain the fluid different in concentration or even in composition from that of the general body of the rest of the fluid ; this will give rise to " concentration-cell " pitting which is highly destructive because it tends to continue its action indefinitely, and not to stop itself, as is often the case in other forms of corrosion.

Heterogeneity which gives rise to pitting need not necessarily arise from the presence of inclusions. Composition gradients within individual metal crystals, or unevenly distributed strains may be sufficient to give rise to local differences in solution pressure which in turn may lead to pitting : this cause of pitting is not easy to discern and may be a dangerous one.

Pitting is, of course, highly objectionable because of its stress-raising action, and particularly as its presence is not always immediately obvious.

(c) *Concentration or Solution Cells*

Where different parts of a metallic area are in contact with a corrosive liquid at different concentrations, electrochemical action is set up and corrosion proceeds. Such concentration differences may be effectively brought about by solid products of corrosion preventing free contact of the corrosive with the metal at some early stage in the corrosion: under these circumstances the metal is preferentially attacked at places where its contact with the corrosive is worse than it is elsewhere. The well known "differential aeration" form of corrosion is really a special case of a concentration cell. In this case, those parts of the metal which are exposed to the action of corrosive liquid containing more dissolved oxygen will be protected, and those parts exposed to the action of the corrosive liquid containing less dissolved oxygen will be attacked, often very destructively. This differential aeration principle may be of importance in the case of flying-boat hulls or sea-plane floats, which, because of their design, may in places be in contact with "pockets" of water which is not changed so frequently as the surrounding liquid; this water tends to become impoverished in oxygen and hence a concentration cell may be set up in which the interior of the "pocketing" metal corrodes.

(d) *Corrosion-cracking*

("Season cracking.") This type of failure may occur when metal parts which are in a state of internal stress (residual from cold working usually) are brought into contact with certain corrosive reagents. Mercury is one of these, and if brought into contact with heavily cold-worked brass or copper-nickel alloy will cause the article to crack open immediately. Some oils, and the products of combustion of some oils may have the same effect. Only certain materials, however, are liable to this form of failure, and then only when in the cold-worked state.

(e) *Corrosion-fatigue*

If a metal is subjected to cyclic reversals of stress and is at the same time exposed to the action of corrosive agencies, its fatigue resistant properties and its power of resisting corrosion are both impaired, and rapid damage results. Corrosion in the absence of stress reversals is normally localised to the surface layers; in combination with fatigue stresses (which also attack the outer layers), the corrosive action penetrates the interior of the metal along cracks propagated with increasing rapidity.

Normally, fatigue tests—such as the Wöhler or the Haigh—are carried out in air. These can actually be regarded as corrosion fatigue tests, since agencies in the air may be exerting a corroding influence during the test. Tests carried out in vacuo or even with the test-piece partially protected from air give higher figures than those obtained in the ordinary way. Air therefore has a destructive effect; aerated salt water, however, is much more dangerous in this connection.

In view of these considerations, it is possible to draw up the requirements of an ideal corrosion resisting part. It should:—

1. Possess a chemically and physically homogeneous surface.
2. Possess a surface (whether metallic, metallic coating or oxide) with a low solution pressure under all conditions of acidity and aeration, should be able to retain this characteristic under varying conditions of wear, stress and temperature.
3. Possess a high surface polish. Absence of scratches will enable it to resist the effect of corrosion-fatigue, and to prevent the incipience of differential aeration cells.

The utility of the practically available corrosion resistant materials may now be briefly reviewed.

The aircraft engineer is forced to consider only metals with a high strength to weight ratio, and the light metals and high tensile steels are for this reason foremost in the materials which he must use.

Magnesium and Its Alloys

The remarkably low density of magnesium—1.74—has made it especially interesting to the aircraft engineer, particularly as, although the pure metal is weak in the alloyed state it can be obtained in strengths similar to those for aluminium and its alloys.

The commercially important alloys of magnesium are those with aluminium, manganese or zinc. While those alloys high in aluminium are stronger, the best general corrosion resistant material is obtained in the manganese alloy range when the alloy content consists of 1–2 per cent. manganese.

Under conditions of ordinary atmospheric corrosion, magnesium alloys develop a protective oxide film which darkens the surface of the metal. This film has considerable resistance, and if the metal is additionally protected by thorough painting, it will give a good life.

The oxide film of many of the alloys break down, however, when subjected to conditions of salt spray or when submerged in salt water, and they deteriorate rapidly, even if painted or lacquered. Under these conditions the manganese alloy gives by far the best performance; even this alloy, however, cannot be said to be highly resistant, since it tends to pit.

No really satisfactory method of protecting magnesium with another metal—plated or sprayed—has as yet been devised, and anodic oxidation has not proved successful. Intercrystalline corrosion, common in certain aluminium alloys, has not been observed in the magnesium-aluminium-zinc alloys.

Magnesium alloys corrode galvanically if in contact with aluminium or its alloys and they should therefore be insulated from each other by paints or bitumastic materials

Aluminium and Its Alloys

There are four materials in the numerous aluminium group which exhibit good corrosion resistant properties under arduous conditions.
These are:—

1. "Pure" aluminium. This is available in the wrought form.
2. Aluminium-manganese alloy containing 1–1½ per cent. manganese. Wrought.
3. Aluminium-magnesium alloy, containing magnesium 3-6 per cent. and manganese .25-.75 per cent. Wrought or cast.
4. Aluminium-silicon alloy containing 10–13 per cent. silicon. Cast Resists fatty acids as well as sea-water.

Though aluminium is actually a "base" metal as far as the electrochemical series is concerned, it in fact behaves as a material with a low solution pressure owing to the highly protective and tenacious oxide film which is formed and maintained under many chemical conditions, and this behaviour shows to a greater or less extent in its alloys. The duralumin type of alloy, though important for other reasons, is not remarkable for its corrosion resistance, and in fact all aluminium alloys containing copper or zinc appear to be adversely affected as compared with the pure metal.

Duralumin which has been given incorrect heat-treatment, particularly by ageing at high temperatures, is liable to intercrystalline deterioration on exposure to sea water, which brings its tensile strength and fatigue strength down very quickly; when properly aged at room temperature, however, duralumin is only pitted by sea-water, usually quite slowly.

In applications where the corrosive attack is mild—as in inland urban or rural atmospheres—the differences between the various commercial alloys of aluminium are slight; where salt spray or sea water has to be encountered, however, the differences are much more marked, and the above four alloys are then outstanding.

In contact with duralumin, aluminium corrodes galvanically; this accounts for the efficacy of "Alclad" in seaplane construction, in which such corrosion as is produced is concentrated on the aluminium. Further,

Alclad sheet with duralumin rivets or with unprotected cut edges may safely be left exposed to salt water without fear of the duralumin being attacked. The galvanic behaviour towards steels is variable, depending on the conditions of exposure.

Under conditions where the corrosive influences are potent, as in marine work, the corrosion resistance of aluminium and its alloys can be improved by painting. The anodic oxidation process too is useful in this direction, since by it the oxide film on the metal surface is increased many times. This has the effect of increasing the superficial hardness and wear resistance and acts as a good basis for paint or dye. The four alloys cited above are all suitable for anodising; the high silicon alloy, however, forms a dark and rather blotchy coat.

Aluminium and its alloys suffer from corrosion-fatique phenomena. For example, heat-treated duralumin, fatigue-tested in air, showed an endurance limit of 16,000 lbs. per sq. in. (for 10^9 reversals); tested in a stream of fresh water, the corresponding figure was 8,000 lbs. per sq. in., and in a stream of salt water it was 6,500 lbs. per sq. in. Further, the frequency of the cyclic stress is important: the higher the frequency, the more marked the damage. Duralumin suffered a 15 per cent. drop in its fatigue limit on testing after having been exposed in fresh water to a stress of 14,000 lbs. per sq. in., applied at 10,000 r.p.m. frequency for 2.4 hrs.: when the frequency was 1,450 r.p.m., however, the time to produce the same deterioration was 14.4 hrs. The 15 per cent. drop quoted means 15 per cent. below that resulting from similar stressless corrosion.

Irons and Steels

The comparatively recent development of the stainless irons and steels has been a matter of the utmost practical value, the importance of which need not be laboured.

Although various elements increase the corrosion resistance of iron and steel, there is one in particular which confers outstanding corrosion resistance—that is chromium. The influence of chromium in this direction is furthermore enhanced by the presence of nickel. Stainless irons and steels therefore usually contain both these additions.

Stainless Steels

Although alloy steels containing less than 12 per cent. of chromium are valuable and are somewhat more corrosion resistant than plain carbon steels, it is not until this figure is reached that good corrosion resistance is attained.

In the stainless steel range there is a general broad division:—

(*a*) Hardenable steels, containing about 12–14 per cent. chromium, up to 1.0 per cent. nickel, and the necessary amount of carbon to produce the properties required.

(*b*) Non-hardenable austenitic steels containing about 18 per cent. chromium and 8 per cent. nickel.

This steel is structurally homogeneous and is tough. There are also steels of higher chromium content—up to 30 per cent.; the above are, however, standard types.

The beneficial influence of chromium on the steel is to cause it to develop a protective oxide film which makes it "passive" to many forms of corrosion. The non-corrodibility of the steel depends on the continuance of this passive state. A solution which maintains the oxide film will therefore not attack it; neutral solutions like sea-water will, however, make it "active" and corrodible in the presence of concentration cells such as those set up, for example, by pores in welded metal or differential aeration caused by the adherence of barnacles. With these alloys generally, therefore, there tends to be a sharp borderline—they are either resistant or corroded according to the conditions; within the one range of conditions, however, slight alteration of these does not have much effect on the *rate* of attack.

The carbon content of these steels has a most important bearing on their corrosion resistance. If they are heat treated in such a way as to involve the precipitation of the carbon as iron-chromium carbide, then chromium is withdrawn from the iron matrix into the carbides, and the latter no longer contains sufficient chromium to make it generally corrosion resistant. The zones low in chromium are in the neighbourhood of the sites of carbide precipitation; in the steels of type (*a*) above the precipitation in general; in the Austenitic steels, however, the precipitation may be largely in the grain boundaries and causes a local chromium impoverishment of high intensity. This state of affairs will then cause grain boundary corrosion of a rapid and dangerous type.

Increasing the carbon content of these steels is therefore dangerous, since greater care must be taken to avoid grain-boundary precipitation in any heat-treatment operations, and it may therefore be said that carbon decreases the resistance of these steels to corrosion.

Austenitic stainless steel is not liable to grain-boundary attack if properly treated, however. The dangerous range of temperature is 500–750° C. and a steel containing only 0.080 per cent. carbon may be made liable to grain-boundary attack after being held for only two minutes in this temperature range. In welding, a zone of sensitivity to this form of attack is developed at regions where the temperatures reach this figure.

If for any operation these temperatures must be exceeded, then the rate of cooling through the dangerous range must be made rapid. Thus high temperature treatment followed by rapid cooling may be applied to welded articles, and rapid cooling is necessary from forging or annealing temperatures.

The addition of about 0.2 per cent. of titanium to the steel has a beneficial action in eliminating the tendency to intergranular corrosion, since it takes the place of chromium in forming carbides and hence depletion in chromium content cannot occur even if the steel is held in the dangerous range.

Being so corrosion resistant (when "passive") the stainless steels are dangerous to other metals when galvanically coupled to them, and, for example, will accelerate the attack on ordinary steels in the presence of sea-water.

Sea-water is, moreover, detrimental to both steels (*a*) and (*b*) above as far as corrosion-fatigue is concerned, and the fatigue limit is lowered from about 50,000 lb. per sq. in. (10^8 cycles) in air, to 14,000 and 25,000 lb. per sq. in. when tested in a stream of sea-water. Fresh water has not this damaging action.

Stainless irons are not applicable to aircraft work owing to insufficiently high mechanical properties.

Nickel Alloys

Copper and its alloys find a few more or less specialised uses; zinc base alloys are used in the form of unstressed die castings; apart from these, nickel alloys remain as the only important corrosion resistant group to be considered in aircraft construction.

Although the nickel alloys in general have good corrosion resistant properties, the alloy containing about 67 per cent. nickel, 1½ per cent. iron, 1 per cent. manganese, and the rest copper, and known as "Monel," has a good combination of strength and corrosion resistance; it is furthermore non-magnetic; these properties are retained also at sub-normal temperatures. This has led to a certain usage of Monel or its modifications in such parts as roller chains for retractable landing gear, as fine gauze for plane coverings and for small intricate pressings for engine and other parts that are liable to corrosion. Its strength at high temperatures in combination with its non-corrosive properties has led to its use for valve seatings and exhaust piping.

Having a high general corrosion resistance, Monel is liable to be dangerous in galvanic contact with other metals, expecially in sea-water, the conductivity of which is high—a fact which favours the establishment and destructive action of galvanic cells. It is highly destructive to aluminium and the light alloys; somewhat less so to ordinary steels. Stainless steels are more safe in contact with Monel (so long as they are in the "passive" condition); in sea-water, however, coupling is not altogether safe, as it may lead to pitting of the stainless steel. Brass too, is liable to deterioration in contact with Monel;

bronze or copper may, however, more safely be coupled with it.

Under the conditions usually met with in aircraft service, Monel can be regarded as non-corroding; marine growths will not form on Monel owing to the toxic effect of the copper it contains. Sulphur compounds in industrial atmospheres cause tarnishing; in the absence of these, however, the metal will not tarnish, but will only lose lustre ("fogging") after a long period of time. Sulphides from oil fumes are, however, liable to attack Monel by pitting, while immersion in motor benzol is liable to cause severe pitting. Monel is well adapted for use with mercury, the action of which it withstands indefinitely, provided that it is in the fully annealed state.

Metal Protection

There are a number of protective coatings which may be applied to metals subject to corrosion in order to prevent the corrosion. Some of these are organic, such as paint and lacquers, some are chemically produced at the surface, such as the "coslettizing" of steel, and others consist of metallic deposits, applied by dipping, spraying or plating.

In connection with the metallic protectives there are a number of important factors to be considered, the most important of which is probably the electrochemical relationship between protecting and protected metal. It is regarded as essential that the protecting metal shall be sacrificially dissolved if at any point the basic metal is exposed, rather than that it shall cause accelerated corrosion.

This consideration immediately focuses attention on zinc and cadmium, both of which protect steel in this way, and makes the use of nickel and chromium undesirable.

Hot dipping processes for the application of zinc and cadmium have been found to be somewhat unsatisfactory owing to porosity, in spite of their considerable thickness; electrolytic coats of these metals are however of general value in resisting corrosion, both atmospheric and saline. Cadmium deposit has, moreover, advantages over zinc deposit from various points of view—prominent among which is that it gives a less "brittle" surface; generally, however, their corrosion behaviour is similar in kind.

Cadmium Plate

Cadmium plating is of the order of 0.0003in. and less, and possesses good stability in air and in salt spray and in sea-water. Long time exposure to corrosive industrial atmospheres leads to eventual rusting of steel protected by cadmium; marine atmospheres are not so destructive, however. Although the corrosion of the cadmium is accelerated by its sacrificial behaviour towards iron in the event of the iron surface being exposed, the corrosion rate of cadmium plate in sea-water is nevertheless low, and is several times lower than for zinc plate under similar conditions.

Cadmium plate further confers considerable protection to ordinary steel in corrosion fatigue. A steel with a fatigue limit in air of 60,000 lbs. per sq. in. suffered damage on being tested in running water, so that its fatigue limit fell to 20,000 lbs. per sq. in. Cadmium plated to a depth of 0.0002in., however, and tested in similar running water it gave a fatigue limit of 46,000 lbs. per sq. in.

Cadmium plating has been usefully applied to light alloy air-cooled cylinder heads, where the atmospheric corrosion resistance of the aluminium alloy in question may be much below that of the cadmium. The heat from the cylinder discolours the plate, turning it the dark-brown of cadmium oxide; this superficial oxide film does not, however, impair the protective efficiency of the deposit.

Parts which have been electroplated are liable to be embrittled by the presence in them of dissolved hydrogen from the plating vat. This hydrogen gradually diffuses out under atmospheric conditions, and the original properties of the basic material are restored in the course of time. A more desirable and effective method is to heat the plated article for half-an-hour or more to a temperature between 100 deg. and 200 deg. C., when the hydrogen will be completely driven off.

I.C.I. Alloy Developments

IN January, 1937, Imperial Chemical Industries, Ltd., announced its entry, through its subsidiary, I.C.I. Metals, Ltd., into the light alloy industry as a manufacturer of strip and sheet to the various D.T.D. and British Standard specifications.

Since then the company's interest in this field has become such that it has been decided to embark at once upon a major scheme of development. This will involve the installation of extensive new equipment at the company's works at Witton, near Birmingham, and will consolidate the strong position which I.C.I. holds in the non-ferrous metal industry of the United Kingdom

Data on Alloy

"ALUMINIUM Alloy Sheet and Sections" is the title of one of the latest of the data booklets issued by the British Aluminium Co., Ltd., Adelaide House, London, E.C.4. There is also a new leaflet giving data on aluminium ingots and billets.

"Heat-formed" Piston Rings

WORKING in close co-operation with aero engine constructors, Wellworthy Piston Rings, Ltd., have recently developed, with a high degree of success, the "heat-forming" process of ring manufacture, as opposed to the older method of internal hammering.

Rings are manufactured in the ordinary way from centrifugally cast pots—a process which gives great reliability of material—and are then constrained to a definite shape on a special mandrel, which not only gives the correct finished form but permits of uniform stressing during the process.

Constrained in this manner, they are heated in an electric furnace for a predetermined period and at a high temperature that is varied according to the class of material employed.

Heat-formed rings, it is claimed, have been found to possess superior resistance to loss of tension under heat than rings formed by any other method, and this particular quality has led to their adoption by the majority of engine builders.

Bomb Release Gear

IT is announced that D. H. Bonnella and Son, Ltd., of 46, Osnaburgh Street, London, N.W.1, have been appointed sole selling agents for Handley-Page electrical bomb release gear for Great Britain and Eire; this does not include orders placed by the Air Ministry for supply to the R.A.F.

Presswork and Spinnings

ENTITLED *Sheet Metal Work by Northern Aircraft and Engineering Products, Ltd.*, a leaflet issued by that firm illustrates the application of some of their presswork and spinnings to modern military aircraft; it includes—an entertaining point, this—some amusing caricatures of members of the firm whom the customer may meet if he goes to their extensive new works at Guide Bridge Mill, Ashton-under-Lyne, Lancs, into which they move next week.

AERONAUTICAL PATENT SPECIFICATIONS

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

(*Published July 21, 1938*)

31489. NASH, A. G. F.: Aircraft (487,404).
34821. DUMAX, G. C.: Remote control of aircraft engines (487,677).
35326. BOULTON-PAUL AIRCRAFT LTD., and RANSOM, J.: Riveting machines (487,413).
35363. BENDIX AVIATION CORPORATION: Spraying devices for aeroplane screw propellers (487,792).
35459. ARMSTRONG, J. J. V. (Salzman, J. R. and Snyder, C.): Aeroplanes (487,798).
5342. DUTTON, H. C.: Automatic flying control for model aeroplanes (487,616).
5725. AUTOMOTIVE PRODUCTS CO., LTD., and GATES, G. R. C.: Hydraulic brakes (487,802).
8199. LORENZ AKT.-GES., C.: Antenna structures for wireless direction or course finding (487,446).
16157. SCHERRER, J.: Electric indicating systems for dirigible craft (487,459).
18323. FAIREY AVIATION CO., LTD., LOBELLE, M. J. O., and TROTTER, J. C.: Cockpit covers for use on aircraft, motor boats, and ships and in similar positions (487,548).
18324. SOC. ANON. DES ATELIERS D'AVIATION L. BREQUET: Aircraft having rotative wing systems (487,811).
23845. REICHERT, H. G., and STOBBE, L. H. O.: Lighter-than-air aircraft (487,636).
27377. STANDARD TELEPHONES AND CABLES, LTD.: Reeling systems, particularly applicable to the reeling of antenna wires in aircraft (487,568).
34464. SIEMENS APPARATE UND MASCHINEN GES: Indicating instruments for aircraft (487,755).
4100. SCHNEIDER & CIE and FIEUX, J: Gyroscopes (487,589).

COMMERCIAL AVIATION

THE WEEK AT CROYDON

"A. Viator's" Causerie on Airline Affairs at London's Main Terminal and Elsewhere

SOME time ago I wrote of an Imperial Airways traveller of more than 24 stone whom I thought to be a record breaker. I now hear of a regular 25-stone passenger who used to travel to and from the Isle of Man by West Coast Air Services. He could not get into the seats of the Dragon nor along the gangway so they used to rig up a rug-covered soap box near the door. He got through the doorway sideways and they could only book seven people when he travelled, instead of the usual eight.

A 'phone call from a Liverpool hospital to Olley Air Service resulted in a quick dash to Ipswich to collect an "Iron Lung" which was then flown to Liverpool. A newspaper dramatically mentioned how Capt. Midgeley, the pilot, rushed to his machine with a sandwich in one hand and a half-eaten flying helmet (drat these rats) in the other—or was it the other way round?

All Europe

Imperial Airways have just started a new London-Brussels-Cologne-Frankfort daily service, using D.H.86 machines for the job. The same firm has just got out a remarkably simple and efficient schedule of European air services which indicates at a glance, so far as Europe is concerned, every air connection to and from London. It includes all companies operating to and from England, and you can look up Abo, Brno, Cluj, Jablonec, Uzhorod and Zlin, not to mention romantically named places such as Blackpool, Doncaster, Stoke-on-Trent and Birmingham. There is also Karlovy Vary, which one ought to visit because they obviously must brew a rare vintage there. The name practically tells you so, and anyway it says in brackets "see Karlsbad." Frequency of service, the line number, time of departure and arrival, route, fare and excess baggage are all to be seen at a glance in this truly admirable publication, and there is even a jolly little picture of a bed where an overnight stop is necessary.

First news of any certainty about the epic flight of the amusing Mr. Corrigan reached Fleet Street from Croydon, it seems. At that time everyone, even officials of the airport, believed that the American flyer was on his way to Croydon. There was, in consequence, an invasion of those who batten on that sort of fare. A B.B.C. mobile unit arrived, complete in sinister dark-green plain van, known as the Green Maria, and a news-talk man whom we will call Uncle Icks (French for x).

Thanks, perhaps, to Sir John Reith's influence, the B.B.C. has acquired the 30th concrete post (as you pass in front of the Hotel); it is really a private line to Broadcasting House, which is why they always anchor Green Maria just there. Their idea, a good one, was to get Corrigan to 'phone Broadcasting House and have him relayed to America. There was also one of these news-reel wagons with two tenders, one managing director, five cameramen, two sound men and one unsound man. At least I took him to be that, for he did all the work and did it wrong, whilst the others nickered at him.

For several days during the visit of H.M. the King and H.M. the Queen to Paris, Air France paid this country a graceful tribute by flying small Union Jacks, instead of the usual house flag, from their commercial aircraft.

Wrightways have arranged special facilities for cyclists touring the Continent and are prepared to take cycles, or tandems, and baggage for cyclists at an attractive fare. I believe two airport employees, complete with tandem, have already booked to Paris.

There was considerable excitement one day last week, I'm told, when a passenger was missing. He had arrived early and gone through the necessary formalities, including paying for his ticket. Leaving the baggage with the company, he wandered off, and when departure time drew near all the usual places, buffet, telephone booths, hotel, and so one, were combed in vain for him by perspiring officials. They looked everywhere, even into some of the "Works and Bricks" pits which are dug about the place to trap the unwary, but they did not look up to the zenith from which, or thereabouts, the missing traveller presently descended. He had been filling in time with a five bob joy flight.

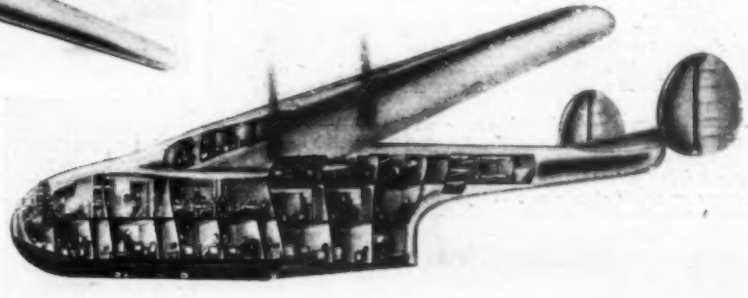
Official Thriller

The 1937 Report on the Progress of Civil Aviation, which is just out, has a cover which strikes quite a gay note amongst official publications. Inside, it is a regular thriller, full of excitements and puzzles.

You start with the Empire boats and the Mayo Composite, which are, in this year of grace 1938, earning an honest living, and you go on to see photographs of giant landplanes which, even to-day, are as seldom seen as Unicorns in a forest. They pop up at official openings and what not, to the joy of Press photographers, and withdraw again in a manner disheartening to airline operators.

Myself, I was baffled by a full-page picture in the Report, of the Willingdon Bridge, Calcutta, to face p. 20, which page, though mostly blank, had a short paragraph on it about a meteorological meeting in New Zealand. I imagine it means something—probably connected somehow with the Official Secrets Act.

A gasp is next wrung from the reader who has been admiring pictures of various aeroplanes in flight by the sight of one entitled, "Herd of Buffalo in flight."



THE YEAR AFTER NEXT: Consolidated Aircraft are interesting themselves more in the civil market. Here are drawings of their 100-passenger design for Pan-American Airways. It is intended to have a maximum speed of 276 m.p.h. at 20,000 ft.—the operating height with specially supercharged engines and pressure cabin. Some details of the project are given on the next page.

COMMERCIAL AVIATION (CONTINUED) : WORLD NEWS

Ilford Beginnings

ON Tuesday the newly formed Southern Airways, a subsidiary of the Straight Corporation, started a regular daily service between Ilford, using the new aerodrome there which is part of the projected London City Airport on Fairlop Plain, and Ramsgate. Two services will be run in each direction daily.

The Straight Corporation has obtained the very useful exclusive rights to operate from the Ilford aerodrome, which is nearer than any other to the centre of London, and additions to the present service are expected to be in operation next year. As a matter of interest, the name of Bury St. Edmunds Airport, Ltd., was recently changed to Southern Airways, Ltd. There is, apparently no particular significance in the change. Incidentally, too, the Romford Flying Club have the instructional rights at Fairlop.

On the following day—that is, yesterday—Western Airways, another subsidiary of the Straight concern, started a twice-daily return service between Cardiff and Swansea, as an extension to the present Weston-Cardiff ferry service. The Jersey Marine aerodrome, which serves, in addition, Neath, Briton Ferry and Port Talbot, is the Swansea terminal. This landing ground is the property of the Earl of Jersey, and has been leased to the Straight Corporation.

Air France's Cadman

AIR FRANCE has been subjected to a searching enquiry somewhat similar to the Cadman Committee's investigation in this country. It is reported from Paris that the Commission appointed last May by the French Air Ministry, to examine the present position of Air France and investigate conditions under which the various routes of the company are being operated, has completed its task. The Commission's report is now in M. Guy La Chambre, the Air Minister's, hands and he is about to give close study to its findings.

On the whole, Air France has emerged from the ordeal, if not unscathed, at least unshaken. The net running costs per kilometre flown are criticised as being high, and attention is drawn to a number of late departures on schedule journeys. But the main criticism is directed against the insufficiency of seating accommodation in many of the machines, which has resulted in substantial losses through business being turned away—a fact which reflects less on the company, which is selling all the seats it has available than on the factories, which are so preoccupied with military orders that they cannot turn out suitable machines fast enough.

This state of affairs is particularly noticeable on the London-Paris line, where seats have been fully booked ever since the new Marcel Blochs were introduced, and duplicated services have had to be put on in many cases. The Commission's report recommends a speeding up in the production of commercial types.

This Year's Atlantic

FOLLOWING *Mercury's* record-breaking flight last week (described on pp. 79-80) an extensive programme involving, in all, fifteen experimental flights across the Atlantic will be made during the rest of the summer by three different types. *Mercury* will be making two more out-and-home trips; the Short *Cabot*, one of the new high-payload Empire boats, will be making two return trips; and yet another two will be made by the first Albatross. Afterwards, the second Albatross will make a further one-way crossing and will remain on the other side of the Atlantic in order that survey flights may be carried out during the winter months.

The actual dates of the crossings will naturally be determined by weather and other conditions, but *Mercury's* next two crossings will be made respectively towards the end of next month and the end of October; the first Albatross crossing will be made in the middle of September and the second early in October; while *Cabot's* flights will also be made in September and October.

After each outward crossing *Mercury* will fly back, so to speak, under her own steam, via the Azores and Lisbon. The first of the Albatross will take off from Collinstown aerodrome, Dublin, and will fly to Hattie's Camp and Montreal, returning by the same route. *Cabot's* crossings, will, of course, be made to Montreal and New York, via Foynes and Botwood, returning by the same route.

The crews for all the flights will be provided by Imperial Airways, and the programme will be carried out jointly by Imperials and the Air Ministry.

Dawn Records

NATURALLY enough, the recent visit of their Majesties to France meant a tremendous increase in the number of daily papers flown across to Paris. Wrightways have been carrying more than two and a half tons of papers every morning and made more than one special landing elsewhere in order to deliver the King's own newspapers.

Since the beginning of 1936, Wrightways' dawn service to Paris, now operated generally with D.H. 86Bs, has only been cancelled owing to weather on ten occasions. It was last week that Mr. J. W. Duggan, who has been flying for Wrightways and previously for Wrightson and Pearse, since May, 1934, made his 1,000th return flight on the service.

All-up to Australia

FOLLOWING the initial semi-experimental through flight with an Empire Boat to Sydney, the all-up air mail scheme for the section between Singapore and Australia came into action on July 23, and the first service leaves Southampton to-day. From now on all letters and letter packets addressed to Australia, New Guinea, New Zealand, Papua and those islands which are normally served by boat from Australia, will be taken the whole distance for 1½d. for each half ounce. The previous air-mail rate for these destinations was 1s. 3d. per half ounce.

As far as the return mail is concerned that from New Zealand and New Guinea will be charged at the standard all-up mail rate, while that from Australia will be charged at 5d. per half ounce. There will be three services a week from this country to Australia.

D.D.L.'s First Condor

ON July 14 Det Danske Luftfartselskab, the Danish airline operating company, took delivery of its first Focke-Wulf Condor. It was flown from Bremen to Copenhagen in an hour and ten minutes—giving an average speed of about 210 m.p.h.

This F.W.200, which has been named *Dania*, will, as forecast in our issue of June 30, be put on the Copenhagen-Hamburg-London route, on which she will make her maiden flight to-day. As a temporary arrangement, and until another Condor is delivered at the end of September, the machine will be used on this as well as on the Copenhagen-Berlin run. The Condor was originally described in *Flight* of December 23, 1937, and some impressions of the machine from the passengers' point of view were given in the issue of June 30, this year.

Another big German commercial machine, the Junkers Ju.90, it may be remembered, recently established height with load records, reaching in one case an altitude of 23,750ft. with 22,046 lb., by way of extended factory tests. It is not generally known that this machine is fitted with a built-in hot-air de-icing system of a type with which D.L.H. have been experimenting for some considerable time.

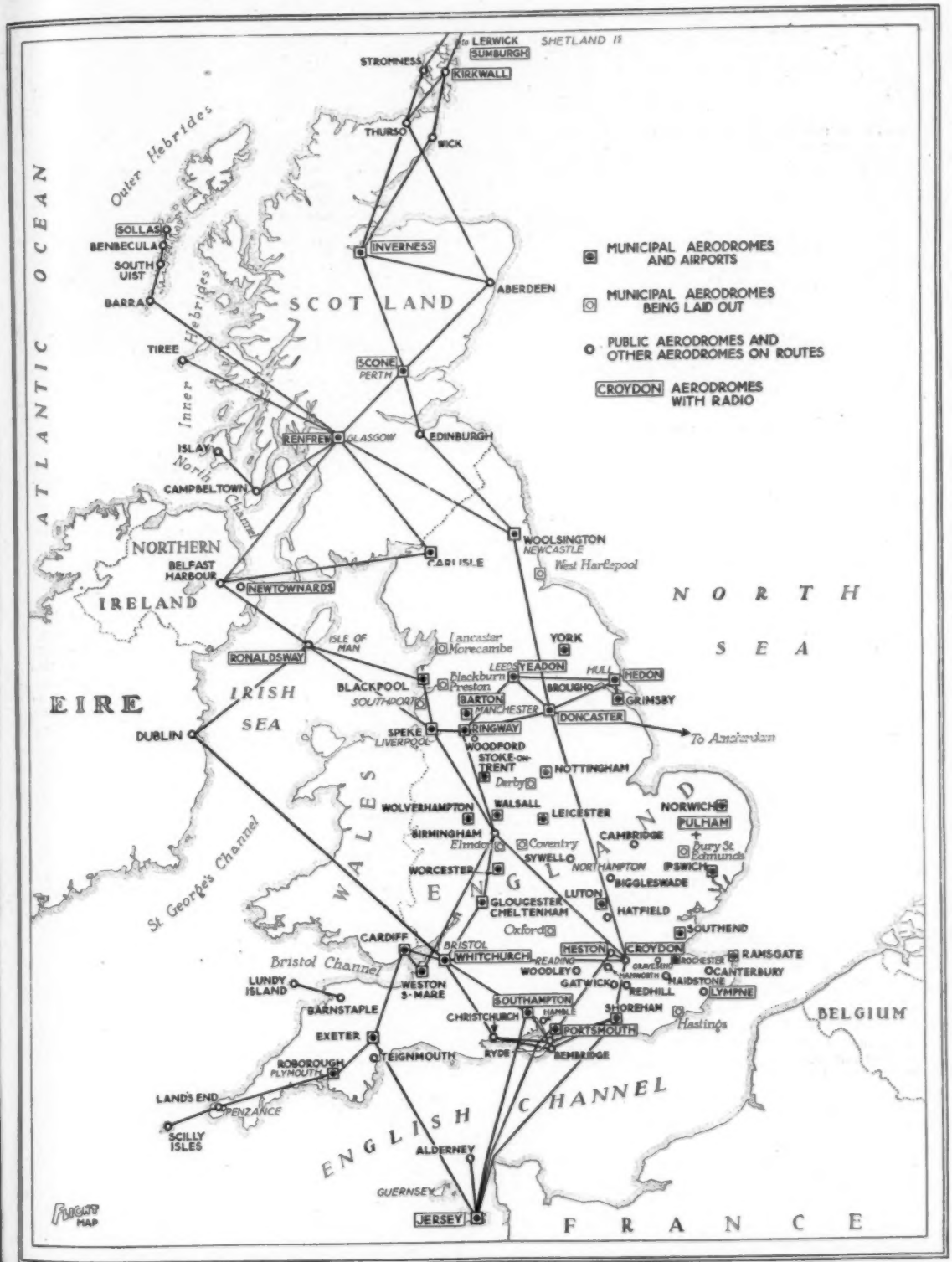
Consolidated's 100-passenger Project

A NUMBER of interesting and unusual features appear in the design which Consolidated Aircraft have put forward following Pan-American Airways' request for tenders for 100-passenger flying boats. It may be remembered that the essential requirements for this machine involve a payload of 25,000 lb., a range of 5,000 miles, and the use of a pressure cabin.

The Consolidated project depends on the development of engines giving more than 2,000 h.p. so that the required number of power units can be reduced from six to four, and thus leave space in the wing for additional passenger accommodation. The engines which are envisaged will be of the liquid-cooled type, and will be located between the spars and drive the airscrews by means of extension shafts. The difficulty of arranging reasonably unrestricted passenger accommodation in the wing was overcome by placing the main bulkheads at the sides of each compartment and using auxiliary arched ribs between them, these being designed so that they do not reduce the effective head room in the compartments. Altogether, thirty-six of the hundred passengers will be accommodated in the wing.

According to the preliminary specifications, the Consolidated boat will have a gross weight of 168,000 lb., a span of 194ft., a maximum speed at 20,000ft. of 276 m.p.h., and a range at this operating altitude of 5,000 miles in still air. The stalling speed at sea level with half the fuel load, with the flaps down and with power on—interesting and significant qualifications—is given as 78 m.p.h.

ON THE AIRLINE MAP TO-DAY



Great Britain's internal airlines and aerodromes as they appear at the moment. Only public aerodromes are shown in this map, which also, for reasons of clarity, does not indicate external services. Those private and R.A.F. aerodromes which are scheduled stops on the air services are, however, indicated, together with two external services which touch at more than one point.

PRIVATE FLYING

Topics of the Day

Spoon-feeding

WELL, the clubs really are to be State-fed out of a very large spoon; there will be little need for them to worry their collective heads about ways and means of obtaining new novitiates and of inducing the just "A"-licenced pilots to continue their flying—up to the somewhat feeble maximum of ten hours.

Very nice, too. But it is a pity, perhaps, that the clubs have found it necessary to pay for their continuance by losing at least some of their freedom. From now on there is the risk that they will become little military organisations with the accent right off whatever there ever was of "private flying." Needless to say, clubs deserved and needed more assistance for their very survival, and they have, in any case, been partly dependent on Government subsidy during the past thirteen years.

The awful part about it, though, is the realisation that private flying, as such, has proved incapable of being self-supporting, and nearly everything to do with aviation is now roped in under State control. There remains the six-hundred-odd private owners, who will continue, presumably, to pay through the nose for freedom. They are not likely to be encouraged to give up their aeroplanes merely for the sake of ten hours' virtually free flying every year, and I have always considered that ownership is the best means of finding out all about real flying.

Encouraging Manufacture

IN the meantime, it remains to be seen which way the clubs will turn for the kind of machine which, while having useful training characteristics, will be really cheap to operate. The scheme allows for different rates of payment for larger and smaller types, so that each will have an equal chance, but previously there has been no direct encouragement for the manufacturers of the little fellows.

There are now two or three really good British lightweights, in the true sense of the word, either in active production or coming along, and if it does nothing else, the subsidy may help a few patient manufacturers who have been struggling along during the last year or two. The initial ultra-light mania has faded out and those machines which still remain on the market are both safe and useful. With the fillip provided by the new assistance, manufacturers will have an opportunity of getting down to the business of designing and producing even better light aeroplanes at a low price, and in the end we may, after all, see a new era of private ownership. Unfortunately, and for the moment, foreign light aeroplanes will be allowed to compete—but that is the fault of our manufacturers.

The position is not quite so rosy in the matter of power units. At the moment there is only one British engine of 50 to 60 h.p. available, and, of two useful machines now to be bought in the smaller class, one is fitted with a Czechoslovakian engine and the other with a converted car engine. Both are excellent in their way, but the first has to be imported from abroad (for the present at any rate) and the second is not an aero engine within the meaning of the Act—and the Air Guard machines must have a C. of A. Next year we should see something really good in the 80 h.p. class.

While conventionally constructed aeroplanes can still be built one at a time, a power unit is rather a different matter, and, unless a firm considers that there is a guaranteed sale in hundreds or even thousands, its manufacture is obviously not worth while. Not only are development costs quite high, but the business of preparing for production is even more expensive. One or two manufacturers may now consider that the expenditure is worth while and, once the engines in the smaller sizes have proved their worth, there should be quite a useful sale abroad.

Afterwards

IN the midst of all these good tidings, it is worth remembering that only ten hours' flying is subsidised and secretaries will still be worrying about ways and means of keeping people in the air beyond this figure. Some quite useful suggestions were put to me recently. My informant was an instructor at a club which, in spite of what might be considered as an unproductive locality, has been slowly increasing its hourage figures and its membership since it started operations a year or two ago.

This instructor's idea was to make things difficult, but not too difficult, for the "A" licensees. For instance, before members are allowed to go on cross-country flights they must pass quite a stiff general flying test and have flown for three hours under the hood.

You might reasonably ask whether it is a good thing thus to encourage novices in the idea of plunging into bad weather, but the district concerned has some very queer weather characteristics and there are times when it is safer to go up (and fly towards the sea) than to come down. Furthermore, most of the cross-countries from this locality must be made over stretches of water, and anybody who has tried to fly straight and level in poor visibility over water will have appreciated the advantage of blind-flying training. Even when the visibility is such that no difficulty would be experienced when flying over land, its effect on over-sea flying is to remove all vestige of horizon and the only alternative for the non-blind-flying pilot—if he is not to suffer the occasional appearance of a perfectly good ship apparently sitting at an absurd angle in quite the wrong place—is to fly at a dangerously low altitude. With a turn indicator, and the ability to use it, most of these difficulties disappear.

At this club, too, there is a "performance" board which is hung for all to see, and on this board are the names of the members against columns which are headed according to their varying proficiencies. So that no member is able to shoot a line about his capabilities unless these capabilities are real and true. The idea of insisting on refresher dual after every hour or two of solo flying is not new and is standard practice at the Reserve schools. If demanded in the right way, while dangling before the member the hope of new freedom in the future, it is not difficult to get him to suffer this dual without feeling that he is wasting his time and money. So much depends on the instructor himself.

INDICATOR.

REALLY CHEAP FLYING

Details of the Civil Air Guard Scheme : Hourly Rates as Low as 2s. 6d. on Week-days

LAST Saturday the Air Minister, Sir Kingsley Wood, announced the details of the new national organisation which is being set up to provide cheap flying tuition.

The organisation will be known as the Civil Air Guard, and will be civil in character, operating through the light aeroplane clubs. The C.A.G. will be open to any person between the ages of 18 and 50, irrespective of sex, but persons who have undertaken Reserve liability in any of the three Forces will not be eligible.

The agreement with the light aeroplane clubs is for a period of four years, and full particulars can be obtained from any of the light aeroplane clubs or from the secretary of the Civil Air Guard Commission at Ariel House, Strand, London, W.C.2. The central administration of the scheme will be undertaken by a board of five honorary Commissioners. The Air Minister's announcement somewhat naïvely states that "one Commissioner will be a woman and another will be a Scottish representative." Lord Londonderry has accepted office as Chief Commissioner.

The following statement, containing the financial and other arrangements being made in connection with the Civil Air Guard scheme was issued by the Air Ministry last Saturday:—

The present Air Ministry grant of £25 for ordinary new pilot members of a club on obtaining their "A" licence, will be increased, in the case of members who volunteer for Civil Air Guard service. The new grant will be £50 for members trained on standard training types of aircraft, and £30 for members trained on the lighter types. The grant for the renewal of a licence will be £15, irrespective of type of aircraft used, instead of £10.

The flying grant for flying carried out after an "A" licence has been obtained, will be £2 per hour up to a maximum of 10 hours per annum, instead of 10s. as at present. This maximum amount of flying will be also the minimum flying required for renewal grant. Claims for grants will be dealt with monthly instead of quarterly (as in the existing subsidy scheme), but this provision will be subject to review in the light of experience.

The present subsidy limit for any club, £2,600 per annum, will be maintained in respect of members who do not undertake Civil Air Guard liabilities. For the present there will be no restriction of Civil Air Guard subsidy. Any light aeroplane club, whether at present receiving Air Ministry subsidy or not, may apply for inclusion in the Civil Air Guard scheme.

In order to qualify for inclusion in the scheme a club must:—

(a) Give an undertaking that Civil Air Guard members will be required to pay not more than 10s. an hour for standard training types and 5s. an hour for lighter types at week-ends (Saturday and Sunday) and half these rates, i.e., 5s. and 2s. 6d. an hour respectively, at other times. (Flying carried out beyond the requirements of the scheme will be subject to ordinary scales of charges.)

(b) undertake to operate a Civil Air Guard section of not less than twelve members.

Members will be required to sign an undertaking that they will offer their services at once in any state of national emergency, for the purpose of employment in connection with Royal Air Force requirements, or in any other direction concerned with aviation. The membership subscription for the Civil Air Guard section of a club is not to exceed 2s. 6d. annually.

It is proposed that members shall wear a special brown overall with a specially designed "Civil Air Guard" badge on the pocket. A Civil Air Guard button badge will be available for general purposes.

Standard training types of aircraft shall be those having an all-up weight of 1,200 lb. or more. All others will be classed as lighter types. Every aircraft used for Civil Air Guard flying must have a Certificate of Airworthiness issued or validated by the Air Ministry. Aircraft of foreign manufacture may be used, though the use of such machines will be reviewed after about four years.

Purely Social

SOME seventy machines with their assorted crews had come to Deauville by divers routes by lunch-time on Saturday, July 16, for the annual rally, briefly reported last week. The biggest were two of Capt. Percival's new Q.6s—Capt. Percival himself claimed to have come direct from Luton in 60 minutes—and the smallest arrival was the little Chilton, which Mr. Porteous had brought from Gatwick. Mr. Giles Guthrie made a meteoric arrival from Lympne in 50 minutes in his Mew Gull.

It was a difficult day for a crowd of private pilots to cross the Channel to a party. The weather was lowering over England with the ceiling only a few hundred feet from the hill-tops. Over the sea there was no skyline, and even on the short crossing via Folkestone no shore was visible for ten minutes or so. The prudent crossed in batches.

The Deauville Rally is no flying meeting. Those who accept the local aero club's hospitality are well content to leave their aircraft parked on the airport while they sun themselves, dine or drink. The customary crew who go abroad merely to drink in their bedrooms arrived, as did the man who blew his tin trumpet for 24 hours after people had finished laughing at it, and the revellers who amusingly removed the shoes of more sedate guests from their bedroom doors in the early hours.

Saturday night's Casino dinner party was its usual pleasant mixture of good food, cheery noise, dancing and a Parisian cabaret. A gentleman on the stage roared in French the results, presumably, of the arrival competition. No single table, French or British, ceased its chatter, and the waiters continued uninterruptedly while this official made his announcements. However, his unintelligible meaning was clear enough, and when the Glass sisters were summoned to the platform to receive first arrival prize, hearty cheering from the British ranks added to the good-humoured tumult. Air Marshal Joubert de la Ferté, the A.O.C., India (who brought his family in a Dragonfly) and Flt. Lt. H. R. A. Edwards—who now contemplates a Comet flight over great distances—were other arrival winners. Edwards spent much of his time with Maestro Clouston in discussions upon Comet management. We might hazard a guess that South Africa is the possible destination of the much-travelled winner of the 1934 Australia race.

Deauville ralliers this year were asked (and willingly complied with the request) to subscribe a guinea each for a cocktail party to the Deauville Aero Club in appreciation of its hospitality. Some £130 must have been put up towards the champagne, cocktail and sandwich gathering that met on the Royal Hotel terrace for a couple of hours on the Sunday evening.

Just before, Mr. Geoffrey de Havilland made a spectacular departure homewards in the T.K.2. A series of slow rolls, coming lower and lower to the waves, arrested bathers' attention for some minutes until he finally disappeared over the headland.

Among those at the party was Mr. "Bob" Perkins, M.P., who precipitated the Cadman tumult; he had arrived at Deauville via Holland, in a Hornet.

The gathering broke up after excitedly watching sure-footed waiters extinguishing the fire caused by a cigarette thrown on the great awning above the hotel entrance. The fire-fighters, poised precariously on ledges, poured the contents of water-jugs on the smouldering awning.

The Casino dinner invitation was extended to Sunday evening. The wise ones who wished to get away the next morning took taxis out to the aerodrome to collect their machines. The others came by the 10 o'clock coach that made its customary informal appearance at nearly midday.

Once again it was a good party.

Budapest and Dinard

TO commemorate the nine hundredth anniversary of King St. Stephen of Hungary, a flying meeting will be held at Budapest between August 7 and 14. The participation fee for the seven-day programme is 265 pengoes for every person. Entries for this meeting should be forwarded as soon as possible.

On August 28 the Dinard International Air Rally will be held, with competitions open to machines not exceeding 450 h.p. The French Air Ministry is giving prizes amounting to 100,000 francs.

Information about each of these events can be obtained from the Royal Aero Club.

Private Flying

C.A.G. EXPERIMENT?

The Work of the County Flying Club : Last Saturday's Meeting at Rearsby

ACCIDENTALLY or otherwise, the date of the County Flying Club's meeting was a particularly apt one. Starting in a small way with Drones, this club is now operating three American Taylor Cubs and is providing flying tuition at exceptionally cheap rates. Since the project has been sponsored, and to some extent financially assisted, by Mr. Lindsay Everard, M.P., it may be considered to have been a full-scale experiment in the ideas on which the new Civil Air Guard scheme has been based. The most careful accounts have been kept during the past year, so that the club officials could discover exactly what training in lightweights would cost and, consequently, the amount of subsidy necessary to bring this cost down to a figure which would not be beyond average means.

Elsewhere the financial assistance which has been privately given to the County Flying Club has sometimes been very much exaggerated. In fact, we believe that Mr. Everard paid the deposits for the purchase of the first two Cubs, though the third has been bought by the club itself, and any other loans seem to have been arranged on a most business-like basis. Unfortunately, but inevitably, the machines used by the club are of American origin, and it is perhaps significant that the use of foreign machines is, for the time being at any rate, to be permitted in the C.A.G.

Last Saturday's flying meeting at the club's private aerodrome at Rearsby (next door to Mr. Everard's, at Ratcliffe) was primarily concerned with the official opening of the new clubhouse, the cost of which has been borne entirely by the club finances. Following the ceremony, however, there was a display, mainly by pilots of light and ultra-light aeroplanes of particular merit and interest. Quite a surprising number of flying visitors turned up—particularly as, from our own experience, the visibility in various parts of the country was of a discouragingly low order. Altogether there must have been nearly thirty aeroplanes, private and otherwise, lined up on the aerodrome boundary. The field at Rearsby, incidentally, is of quite adequate size, and the runs in two directions, at least, are fully up to Maybury standards. On Saturday there was no wind at all, and during the arrival competition people put down from all sorts of directions. Later on the control, consisting of F/O. A. H. Hole (as wielder of the Aldis light) and Capt. R. L. Preston (in charge of the microphone) arranged that all machines should take off and land in one particular direction only—that of the longest run. These controllers were adequately and aerially mounted on an ancient coach, whence they had a perfect view of all the proceedings.

Three Taylor Cubs, representing the County Club's fleet, fly in professional formation over the new clubhouse at Rearsby.

This elegant coach was used by F/O. Hole and Capt. Preston as the control and commentator's eyrie at Rearsby. Unfortunately, the amateur cameraman rather missed the former.

Speeches were made by Mr. Everard himself, by Air Comdre. Chamier, by Baron de la Grange, president of the French Aero Club, and by the Mayor of Leicester. Baron de la Grange came over in a Farman, which appeared, perhaps, a little lonely amongst a host of ultra-lights and a few typically British aeroplanes of different dimensions.

Among the demonstrations undoubtedly the most impressive was the formation flight by three Cubs. This show was entirely professional. The formation was led by Mr. Elwell, in the latest demonstrator, with an Everel single-blade airscrew, the rest of the flight being made up by two club Cubs flown by Messrs. Collins and Headley. The third of the club machines was in evidence, but had only just been flown back from Hanworth after a one-day longeron repair, and was not, perhaps, considered really quite ready for inclusion in the formation. In any case, the brand-new demonstrator made a good leader.

Two other performances were particularly worthy of mention, one by Mr. Collins with a Drone, and the other by Mr. Warren with one of the Leicestershire Club's Tigers. The former really has brought crazy flying with the Drone to a fine art, and his antics in any other type would have appeared dangerous. As it was, the Drone revelled in it, and the demonstration showed that this type has tremendous possibilities for shows of this description at the different flying events. The very fact that it can be flown safely at next to no feet and can be turned, either on or off the ground, within small areas gives the public full value. The pilot of the Tiger played the part of the inevitable newcomer—in this case a clergyman from a parish in new Zealand—who is put into an aeroplane for the first time. Warren, equally inevitably, wound up his crazy flying and landing exhibition with perfect spot touchdown a few yards from the enclosures.

When these two had finished their respective shows what little lift that had previously been in the sultry sky must have been used up. However, Mr. Brie made an excellent best of the circumstances in a C.30 Autogiro, though one felt sorry that he had not got the use of that very little breeze which can make his demonstrations so much more effective.

The arrival competition, the zero time for which was round about 2.32 p.m., was won by Mr. Roy Winn, the secretary of the Leicestershire Club.

FROM the CLUBS and SCHOOLS

LONDON

A FURTHER improvement in flying times was achieved last week with a total of 138 hr. 25 min. Mr. R. Gillett has made his first solo flight, while four new members joined during the week.

EDINBURGH

During last week the Club's total flying time amounted to 58 hr. Within the same period seven aircraft visited the club.

MARSHALL'S

Two pupils of Marshall's Flying School, Messrs. Darling and Myland, completed their "A" licence tests last week, during which the flying total was 80 hours.

HULL

Twenty-eight members are now training for their "A" licences. During the month of June the flying time amounted to 89 hr. 15 min.

SOUTHEND

Great interest was shown in the Civil Air Guard last week-end by would-be candidates. Flying times have been well up to the average and during the week Mr. E. J. Bell essayed on his first solo.

ROMFORD

Seventy-two hours' flying has been put in by the Romford Flying Club during the fortnight ended July 24. Miss M. Haseldine and Mr. F. Cooper made first solos.

YORKSHIRE

A number of taxi trips have been booked for next week-end, including one to Dornoch. Total flying time for the week amounted to 83 hr. 15 min., while the figures for the month now stand at 212 hr.

READING

During the past week twelve machines have visited the club. So that several new members may have the opportunity to compete for the Barnes Challenge Cup, the period for taking tests has been extended to August 31st.

BORDER

Flying time increased considerably at Carlisle during last week, and the total for the first three weeks in July amounted to 75 hr. 15 min. Something like 200 people were taken for flights last week, and the Fox Moth is more than justifying its purchase.

KARACHI

Bad weather was again responsible for curtailed flying time, which amounted to 120 hr. 30 min. for the month. Mr. Khilnani obtained his "A" licence, whilst Dr. Dutschler and Mr. Ogilvie were qualified to fly the Monospar and Mr. Jhangiani to fly the Leopard Moth.

NORFOLK AND NORWICH

At the end of last week Mr. A. Kirby took his leave of the club to take up a new appointment. During his 10½-year sojourn in Norwich Mr. Kirby has done over 1,500 flying hours and trained over fifty pilots. Mr. E. B. Brooks, a new member, has already started training with the chief instructor.

YORK AND LEEMING

Twelve new members joined the club during July, while three members have carried out their first solo flights. Flying time for last week totalled 58 hr. 50 min. Cross-country flights were made to Norwich, Skegness, Blackpool and Romford. The first section of the new Civil Air Guard is now complete and the second is well under way.

C.A.S.C.

Three machines recently visited Sywell and one went to Bristol, while last week-end members of the Corps visited Le Touquet.

CINQUE PORTS

Entrance to Lympne Airport will be free to visitors on the occasion of the Folkestone Aero Trophy Race, to be held next Saturday, July 30th. Visitors by air will be especially welcomed. Flying time for last week amounted to 73 hr. Mr. H. D. Donkin was successful in passing all his "A" licence tests.

HAMPSHIRE

Early last week Messrs. J. A. Currie and M. R. Ingle-Finch, each with a passenger, flew in two Moths to Le Touquet for the day, returning the same evening. Two new members, Miss Yvonne Howetson and Mr. H. R. Parry, have joined the club. Flying time for last week totalled 64 hr. 30 min.

BOURNEMOUTH

Two new members, Mr. R. E. Dingwall and Miss M. Severn, have joined the club, while another member, Mr. E. K. P. Ince, achieved his first solo in four days. During the week the flying time totalled 36 hr. Messrs. T. Holloway and J. T. W. Avis have now passed their "A" licence tests.

BARTON (BEDS)

Three pupils of the Bedford School of Flying, Messrs. J. Unwin, W. R. Phillips and A. Dixon, obtained their "A" licences last week, and Messrs. F. R. Wilbraham and J. Godfrey made first solos. The club, by the way, has a twenty-one years' lease of Barton aerodrome.

REDHILL

Flying at Redhill last week included a visit by two club machines to the Deauville Rally, a flight to Holland with the Leopard Moth and the visit of three machines to Maidstone for the dawn patrol—the crew of two of them obtaining free breakfasts. Last week's flying total was 71 hr. 20 min. and seven new members joined.

HYDERABAD

During June the Hyderabad State Aero Club put up 38 hours' flying, this figure including about 18 hours of charter and other commercial work. The decrease in flying was due to the bad weather conditions prevailing. Mr. P. M. Reddy, the assistant instructor, has taken charge of the flying while Mr. A. W. Whitta is on leave.

LEICESTERSHIRE

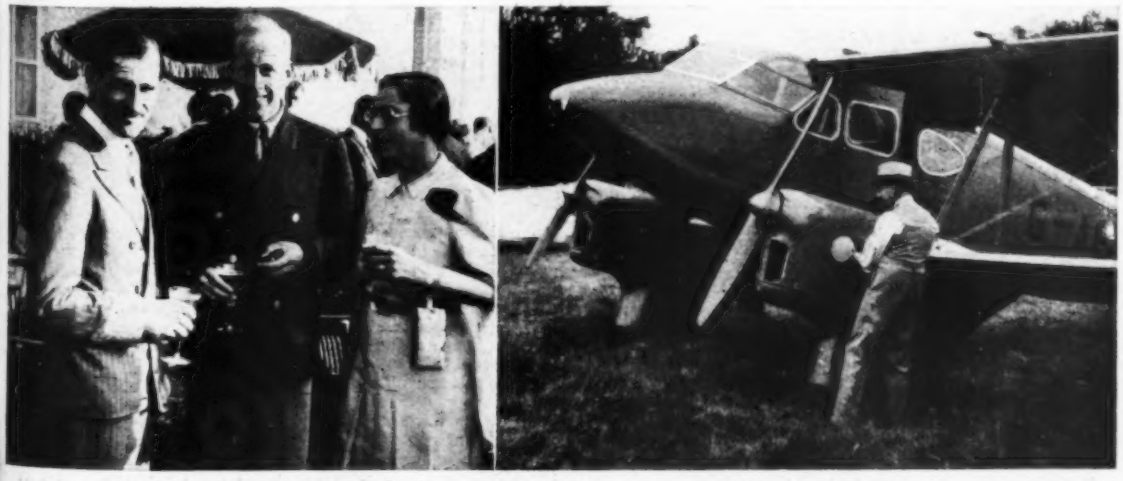
Last Sunday's attack on the day hourage record by the Leicestershire Aero Club was successful, the previous best of 24 hr. 50 min. being increased to 27 hr. 20 min. During the last three weeks first solos have been made by Miss E. Martin and Messrs. R. J. Emerson, W. E. Wykes, R. P. Adler and J. A. Hill.

HANWORTH

Members of the London Air Park Flying Club are reminded that entrance forms for the A.E.M. Trophy competition must be in the hands of the secretary by to-day. Flying time for the week amounted to 104 hr. 15 min. Two new members have joined, while Mr. A. N. Le Chaminant has successfully passed his "A" licence tests.

STRATHTAY

For the week ending July 20th the total flying time amounted to 25 hr. Mr. G. C. Halley, having obtained his instructor's endorsement, will now be assisting Miss Cunnison in her duties. Mr. George MacLean has now passed his "A" licence tests and Mr. Cook has achieved his first solo. During the week four new members joined the club.



AT DEAUVILLE: on the left F/O A. E. Clouston, Flt. Lt. H. R. A. Edwards and Mrs. Edwards discuss the possibilities of the Comet for long-distance flying (see the story of the Rally on p. 81). In the other photograph Air Marshal Joubert de la Ferté prepares to start his Dragonfly—actually the D.H. and London Club training and general communication machine.

MR. CORRIGAN'S MISTAKE

DOUGLAS CORRIGAN'S solo Atlantic crossing, briefly chronicled last week, will go down in history as the example, *sans egal*, of brilliantly foolhardy aviation. It was supreme in its casualness and its acceptance of a risk which was probably 10 to 1 against. Yet Mr. Corrigan is to be admired if only because he refrained from saying things like, "The engine was wonderful" or (worse still) "I did it for the glory of aviation." What he did say was, "It was all a mistake."

In an eight-year-old Curtiss Robin high-wing cabin monoplane, with equally venerable 165 h.p. Wright Whirlwind five-cylinder radial, Corrigan had flown 3,200 miles non-stop from Long Beach, California, to New York a few days previously. According to report, an application by Corrigan to attempt an Atlantic crossing last year had been refused. He took off from Floyd Bennett Field at 10.15 hours, B.S.T., on July 17, and it was understood that he was attempting a return non-stop trip to California. Instead, he departed on an easterly course. The next news was of his crossing of the Irish coast and then, at 14.30 hours on July 18, of his landing at Baldonnel Aerodrome, Dublin. Cruising at an air speed of 80-90 m.p.h., he had made the crossing in 28 hr. 13 min.

And this, according to the *Daily Telegraph*, was the enterprising Mr. Corrigan's story on arrival:—

"Before I took off from New York I set the compass properly, as I thought, but here is where it brought me! Having flown for 25 hours above the clouds, I decided to come down to find out where I was.

"I saw mountains and said: 'Good! That's California.' But some time later on I saw the sea and thought I was over Hudson's Bay. I struck land again and saw that the mountains were not rugged enough for any Californian range that I knew. I realised then that I was over Ireland, and that the old compass had let me down—or, rather, that I had done it by making that initial mistake.

"I followed the coastline, then cut inwards to the east and found myself over Baldonnel, where I brought the bus down."

Asked how, with his knowledge of aircraft, he happened to make such a mistake, Corrigan shrugged his shoulders and said, "Well, the fact is that I am here without a toothbrush, and with no passport or any papers to clear this machine."

"For food I had only a few bars of chocolate, two bottles of water and some fruit. Call them hard rations if you will, but I knew that when I reached California I'd have a good feed. Funny having it in Ireland, isn't it?"

On the subject of rations, a piquant sequel is suggested by a letter which appeared in *The Times* a few days later. It was from M. Emile Aymoz, *maître chef des cuisines* at the Dorchester Hotel. M. Aymoz was concerned as to the kind of meal which calculated to revive one who, under great physical and mental stress, had virtually fasted for 30 hours. "I, myself," writes the *maître*, "would have provided a clear soup made from a good meat stock, because it is nourishing. Then I would have prescribed a mousse de sole with champagne sauce. The mousse de sole because it is easily digested and the champagne sauce because it is a stimulant. Then I think I could not do better than some asparagus tips cooked in butter—they are good for freeing the cramped muscles of the stomach. Finally, I would suggest some fresh raspberries . . ."

And one item in that repast *did* materialise for Mr. Corrigan. The Bureau of Air Commerce has revoked his licence.

The man and the machine.

Bomber-hunting in Canada

MEMBERS of the special mission to Canada left Southampton last Saturday in the *Empress of Britain*. As announced recently in the House of Commons by Sir Kingsley Wood, the mission is proceeding to Canada for the purpose of entering into negotiation with the Canadian aircraft industry for the manufacture of large bombers.

Mr. F. Handley Page, President of the Society of British Aircraft Constructors, and Mr. A. H. Self, Second Deputy-Under Secretary of State at the Air Ministry sailed in the *Empress of Britain*, and Marshal of the Royal Air Force Sir Edward L. Ellington is travelling to Canada from Australia *via* New Zealand. Sir Hardman Lever, K.C.B., had already left for Canada and is meeting the other members of the mission on their arrival.

Company Meetings

SPEAKING at the general meeting of the Bristol Aeroplane Company last Thursday, the chairman, Mr. W. G. Verdon Smith, said that in connection with the large programme of Bristol aircraft and engine building in the "shadow" factories, it was pleasing to be able to record that the companies managing the various factories had acknowledged from time to time in generous terms the great value of the assistance which the Bristol Company had gladly rendered in connection with the numerous difficult technical questions necessarily arising.

As regards overseas business, Mr. Verdon Smith said that it was of great importance (and, he might add, in the national interest also) that all the work of the past years in building up a valuable goodwill and sales organisation should not be wasted by a complete cessation of exports. Therefore, although the Company had been so busy at home, endeavours had been made to respond as far as possible to insistent demands from friendly foreign countries.

As recorded in *Flight* last week, a final Bristol dividend of 17½ per cent. was declared, making 25 per cent. for 1937.

* * *

That there were sufficient orders in the books to keep the plant working at full capacity for two or three years was reported by the chairman, Mr. A. W. Martin, at the annual meeting of Aircraft Components, Ltd., at Cheltenham last Thursday. Still further extensions were in progress and output had increased sufficiently to enable them to give deliveries in accordance with their contracts.

Net profit was £33,773, as compared with £18,552 for the previous year.

* * *

"We are at the moment engaged on the development of an advanced design of flying boat which we hope may contribute substantially to this factory's output in years to come," said Mr. Robert Blackburn (chairman and managing director) at the meeting of Blackburn Aircraft, Ltd., at Brough.

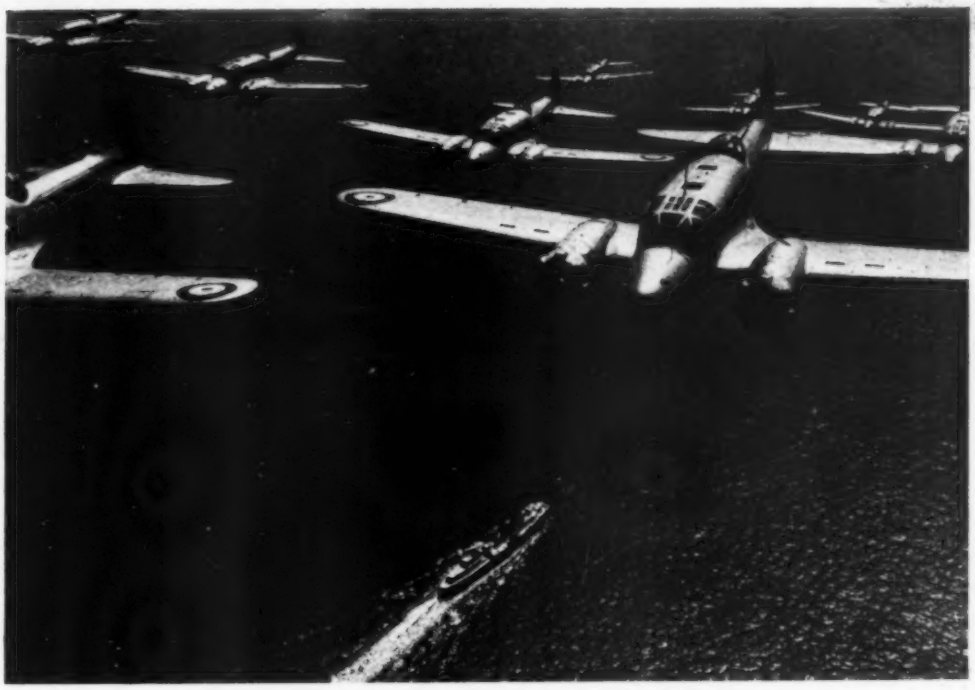
The year under review had been one of the most difficult in the company's history, not only on account of the establishment of the factory on the Clyde, the extension of that at Leeds, and the building up of a large technical personnel in the design and production departments, but also because it embraced the transition period between the completion of orders of the old types and the production of the new types, which involved a completely new method of manufacture and technique. This had exercised to the full the resources of the works-planning and jig and tool departments, but with the preparations made they should maintain economically the much increased output demanded by the expanded programme laid down for them.

"The volume of training at our Flying Schools at Brough and Hanworth continues to expand," Mr. Blackburn said; "the hours flown have materially increased and have again proved a new high record. Our aerodrome at Brough has been extended to more than double its size, although, due to the abnormally dry weather, it has not been possible yet to bring the extension into use. Training is an important part of the company's business and the instructors and ground staff have worked with splendid efficiency."

SERVICE AVIATION

Royal Air Force and Official Announcements :

Fleet Air Arm News : Military Aviation Abroad



ESCORT : A fine impression of Ansons escorting the royal yacht, *Enchantress*, during Their Majesties' recent visit to France. The formation is flying a figure 8 in order to keep in the vicinity of the vessel.

Royal Appointment

THE Air Ministry announces that His Majesty the King has approved the appointment of Air Vice-Marshal His Royal Highness the Duke of Gloucester, K.G., K.T., K.P., G.C.M.G., G.C.V.O., as Honorary Air Commodore of No. 501 (County of Gloucester) (Bomber) Squadron, Auxiliary Air Force.

Training Pilots in Canada

GROUP CAPT. J. M. ROBB, Commandant of the Central Flying School, R.A.F., has been selected to visit Canada in order to discuss with Canadian authorities the possibility of providing facilities in Canada for training pilots for the Royal Air Force.

Expansion

WHEN the House of Commons went into Committee of Supply on a Supplementary Estimate of £22,901,000 last week, the Air Minister explained that this sum would bring the total R.A.F. expenditure this year up to £126,401,000. Aircraft and balloons accounted for £9,000,000, the biggest single item in the Supplementary Estimate. This was required to meet the increased programme of 2,370 Metropolitan first-line aircraft. A sum of £2,500,000 was to be spent on bombs, equipment and reserves of petrol.

Increases in personnel were: 13,000 for the R.A.F., bringing the total to 96,000; raising the Reserve from 31,000 to 50,000; and the Auxiliary Air Force from 9,500 to 11,500.

Direct-entry Air Observers

A NEW class of air observer will, for a limited period, be entered directly from civil life on short engagement to assist in meeting the largely increased requirements of the Royal Air Force in observers during the next two years, since it will not be possible to meet those requirements from airmen now in the service. The new entrants, who must be of good education, will subsequently be trained as airman pilots, if suitable, but it is emphasised that their entry will not affect adversely the prospects open to serving airmen of becoming air observers or airman pilots.

These observers will be selected from candidates who have attained the age of eighteen-and-a-half years but have not reached the age of twenty-five years. Training will consist of three months' instruction in navigation at a civil school, a short disciplinary course at No. 1 R.A.F. Depot, Uxbridge, and twelve weeks' instruction in gunnery and bombing at a Service observers' school.

The initial engagement will be for four years' regular service and six years in the reserve. Extensions of regular service to six years may be permitted at the discretion of the Air Ministry.

Directly entered air observers will be classified as leading aircraftmen while under training. On satisfactory completion of training they will be promoted to corporal but will be strictly on probation until confirmed in rank. They will be eligible for confirmation when they have completed twelve months' probation in the rank.

On transfer to the reserve after satisfactory completion of the full period of regular service a gratuity will be paid, in lieu of ordinary service gratuity, at the rate of £25 for each completed year of regular service after the first, e.g., an airman transferred to the reserve after completing four years' service will be eligible for a gratuity of £75. Gratuity will not be payable to the estate of an airman who dies or is killed during the period of his regular service in the Royal Air Force.

Application should be made to The Secretary, Air Ministry, Kingsway, London, W.C.2.

Transfer of Airmen to the Royal Navy

BY agreement with the Lords Commissioners of the Admiralty arrangements have been made for the selection of a limited number of airmen who volunteer for transfer to the aircraft maintenance branches of the Royal Navy.

To be eligible for consideration, airmen must be below the rank of flight sergeant and mustered in one of the following trades: Fitter, grade I (N.C.O.s only); fitter (aero-engine); metal rigger; fitter, grade II; flight mechanic; flight rigger. Airman pilots and air observers are not eligible for transfer. Candidates need not have had experience with the Fleet Air Arm during their R.A.F. service.

Transferred airmen will be eligible to complete twenty-two years' service qualifying for naval pension. The engagements of transferred airmen who have re-engaged in the Royal Air Force will on transfer be reduced to twenty-two years—the normal period for the Royal Navy. R.A.F. service which would have counted towards eligibility for pension and rate of pension under Air Force Regulations will count for those purposes in the Royal Navy.

SERVICE AVIATION (CONTINUED)

A D.F.C. Awarded

THE following notice appeared in the *London Gazette* of July 5: "The King has been graciously pleased to approve of the undermentioned reward for gallant and distinguished service rendered during the operations in Waziristan, 1938:—

"Distinguished Flying Cross.—Flt. Lt. George Eric Jackson."

New School of Technical Training

THE new R.A.F. School of Technical Training at St. Athan, Glamorgan, will form on September 1.

When completed, it will be the largest R.A.F. Station in this country and will cover more than 900 acres. (Over 3,000 workmen are employed by the fifteen contractors and sub-contractors who are working on the site.)

About 1,000 airmen will be under training when the School opens and it is expected that this number will rise to 3,000 by December. A large proportion of the 9,000 men required under the further R.A.F. expansion scheme announced by Sir Kingsley Wood, will be trained at St. Athan. When their training is completed they will receive pay of 3s. 6d., 4s. 3d. or 5s. a day, according to their proficiency.

St. Athan will be known as No. 4 School of Technical Training (Men) and it will be placed in the Training Command in No. 24 (Training) Group.

Transfer of Officers to the Reserve

THE undermentioned short service, medium service, and non-permanent officers should note that they become due in December and January next for transfer to the reserve or (where indicated) for relinquishment of commission, on completing their period of service on the active list.

General Duties Branch

Flt. Lts. Geoffrey Fox Overbury, Duncan Bassett McGill, Henry Meyrick Cox, *George William Golledge, *William Monteith Graham, *Anthony Geoffrey Strutt Hamilton Charles Stewart Vetch, Charles Herbert Dalrymple Wardrop, Clifford Frederick Cecil Wright, Francis Blomfield Chapman, Harold Stracey Laws.

Medical Branch

Flt. Lts. Hubert Campbell de Burgh Milne, M.R.C.S., L.R.C.P., §David James Sheehan, M.R.C.S., L.R.C.P., Ernest Bruce Harvey, M.R.C.S., L.R.C.P.

Dental Branch

Flt. Lts. Robert Morton Brown, L.D.S., and William Edward Nelson, L.D.S.

Chaplains Branch

‡The Reverend Arthur John Potts.

Those marked * and § have been provisionally selected for permanent commissions.

‡To relinquish commission, not liable for reserve service.

No. 99 (B.) Squadron Dinner

A COMING-OF-AGE dinner for No. 99 (B.) Squadron will take place at the Park Lane Hotel, London, on September 30. All past and present officers who wish to attend should communicate with Flt. Lt. G. E. Peacock, R.A.F. Station, Mildenhall, Suffolk. (Tickets, price 20s.)

The Maintenance Command

HEADQUARTERS, Maintenance Command, moved from the Air Ministry to a temporary location at the R.A.F. Station, Andover, on July 15.

With effect from August 1, the Maintenance Command will take over the executive command of all maintenance units now under No. 24 (Training) Group.

Wellesley's Return Flight

THE four Pegasus-engined long-range Wellesleys which recently made the record long-distance formation flight to Ismailia via the Persian Gulf have returned to this country.

Again under the leadership of Sqn. Ldr. R. Kellet, the machines left Ismailia at 04.00 hrs. B.S.T., July 21, and landed at Upper Heyford, Oxfordshire, at 20.25 hrs., having completed the 2,300 miles in 16 hours 25 minutes, an average speed of 140 m.p.h.

Presumably the machines will want a last look over and even a modification or two after these two long flights before taking off for the final record attempt. In any case, it will be better for the crews to spend the intervening month or two in this country rather than in Egypt during the hot weather.

Flying Accidents

THE Air Ministry regrets to announce the following accidents:—

Flt. Lt. George Nelson is missing and is believed to have lost his life in an accident which occurred near Kundian, India, on July 19 to an aircraft of H.Q., R.A.F., India, and No. 562125 L.A/C. George Green died during the night of July 20-21 from injuries received in the same accident. Flt. Lt. Nelson was the pilot of the aircraft and L.A/C. Green the other member of the crew.

No. 563163 Sgt. Maurice Reginald Kenedy Smith lost his life in an accident which occurred at Hillingdon, Middlesex, on July 20 to an aircraft of No. 111 (F.) Squadron, Northolt. Sgt. Smith was the pilot and sole occupant of the aircraft

No. 517054 A/C.1 Albert William James Robinson and No. 550984 A/C.1 Francis Howard Kent lost their lives in an accident which occurred near Basingstoke on July 21, to an aircraft of No. 105 (B.) Squadron, Harwell, Berkshire. A/C. Robinson and A/C. Kent formed the crew of the aircraft, the pilot of which, No. 580040 Sgt. Albert Joseph Charles Eagles, was not injured.

No. 563323 Cpl. David Owen Day lost his life in an accident which occurred at Bidford-on-Avon, Warwickshire, on July 18, to an aircraft of No. 139 (B.) Squadron, Wyton, Huntingdon. Cpl. Day was a member of the crew of the aircraft. The pilot of the aircraft, P/O. Malcolm Llewellyn McColm, and the other member of the crew, No. 522940 A/C.1 James Hamilton Gordon, were not injured.

Royal Air Force Gazette

General Duties Branch

F/O. G. J. Wright is promoted to the rank of Flt. Lt. (June 15).

The following Flying Officers are granted the acting rank of Flight Lieutenant on the dates stated:—A. G. G. Baird (May 19); P. J. K. Pike, E. Banthorpe, A. R. Atkins, G. Elmslie (June 14).

The following Flying Officers relinquish the acting rank of Flight Lieutenant on the dates stated:—G. E. Harrison (June 13); K. J. Rampling (July 9). Lt. Cdr. J. W. Hale, R.N., Sqn. Ldr. R.A.F., is reattached to the R.A.F. as a Squadron Leader with effect from July 11 and with seniority of July 1; Air Comdre. A. D. Cunningham, C.B.E., is placed on the retired list at his own request (July 19); Wing Cdr. H. S. Powell, M.C., is placed on the retired list at his own request (July 15).

Accountant Branch

F/O. W. M. Lyons (Acting Flt. Lt.) is promoted to the rank of Flt. Lt. (June 1). The following Flying Officers are granted the acting rank of Flt. Lt. (July 1):—W. N. Hibbert, R. C. S. Allin, A. Gollan.

Memorandum

The honorary commission as Second Lt. granted to L. McG. Twemlow is withdrawn (June 21).

ROYAL AIR FORCE RESERVE

General Duties Branch

Lt. E. A. Roberts is granted a commission as Flight Lieutenant in Class C (April 25); F/O. B. S. Brice, A.F.C. (R.A.F., ret.), is granted a commission in that rank in Class C (March 28); Flt. Lt. J. Ramsden is transferred from Class C to Class A (June 14).

Royal Air Force Appointments

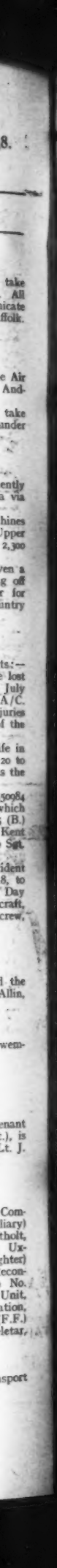
Air Commodore.—F. P. Don, O.B.E., to H.Q., No. 2 (B.) Group, Wyton; for duty as Senior Air Staff Officer, 11.7.38.

Wing Commanders.—W. E. Staton, M.C., D.F.C., to No. 10 (B.) Squadron, Dishforth; to command, 10.6.38. H. E. Forrow, O.B.E., to Special Duty List. R. Young, to Special Duty List.

Squadron Leaders.—C. H. Tighe, D.F.C., to H.Q., No. 24 (Training) Group, Halton; for Engineer Staff duties, 28.6.38. A. A. C. Hyde, to No. 1 Air Armament School, Eastchurch; for Administrative duties, 30.6.38. E. C. T. Edwards, to Deputy Directorate of Organisation, Air Ministry, 27.6.38. P. F. G. Bradley, to Home Aircraft Depot, Henlow; for Engineer duties, 10.7.38. R. A. Chignell, to R.A.F. Station, Biggin Hill; for Administrative duties, 10.7.38. R. J. M. de St. Leger, to Special Duty List. B. V. Reynolds, to H.Q., No. 23 (Training) Group, Grantham; for Air Staff duties, 28.6.38. T. S. Horry, to R.A.F. Station, Seletar, Singapore; for flying duties, 1.7.38.

Flight Lieutenants.—W. R. Baird, to H.Q., Maintenance Command, Andover, 4.7.38. G. P. Marvin, to H.Q., No. 6 (Auxiliary) Group, London, 27.6.38. H. R. L. Hood, to Station Flight, Northolt, 27.6.38. G. E. Valentine, to H.Q., No. 11 (Fighter) Group, Uxbridge, 4.7.38. W. R. Wills-Sandford, to H.Q., No. 11 (Fighter) Group, Uxbridge, 4.7.38. R. C. Richmond, to H.Q., No. 16 (Reconnaissance) Group, Lee-on-Solent, 1.7.38. F. W. L. Wild, to No. 52 (B.) Squadron, Upwood, 4.7.38. A. Pyke, to No. 1 A.-A.C. Unit, South Farnborough, 13.6.38. G. F. Whistondale, to R.A.F. Station, Grantham, 11.7.38. G. P. Seymour Price, to No. 801 (F.F.) Squadron, 23.6.38. N. C. S. Rutter, to R.A.F. Station, Seletar, Singapore, 1.7.38.

Equipment Branch

Flight Lieutenant.—P. J. Mote, to No. 1 Mechanical Transport Storage and "D" Maintenance Unit, Wembley, 4.7.38.

Owing to the greatly increased length of these lists as a result of R.A.F. expansion, ranks are confined to those of Flight Lieutenant and above.